







BARNEY OLDFIELD'S
BOOK FOR THE MOTORIST



Barney Oldfield

BARNEY OLDFIELD'S BOOK FOR THE MOTORIST

BY
BARNEY OLDFIELD

With a Sketch of
Barney Oldfield's Life
by Homer C. George



BOSTON
SMALL, MAYNARD & COMPANY
PUBLISHERS

TL 208
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\$ 1.50 net.

JUN 23 1919

19-26574

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INTRODUCTION

INTRODUCTION

IN every line of human achievement some one name stands out as pre-eminent. And the rule holds good in the world of sport. Baseball has its Tyrus Cobb; John L. Sullivan is the immortal hero of the prize ring; Vardon the commanding figure in the history of golf.

In automobile racing, the name which has become a household word in every civilized country is that of Barney Oldfield. Others have equalled, and even surpassed, his speed achievements, but he was the pioneer, and to him belongs the enduring glory. As the first great American driver, Barney Oldfield was the first man who dared risk his life to crowd a mile within the fleeting compass of sixty seconds; the first, at a later period of automobile development, to realize the terrific speed of 130 miles an hour. The fact that others have broken Oldfield's records cannot dim the luster of his fame. Many a discoverer crossed

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the ocean after Columbus, in faster and better ships.

The story of Barney Oldfield's life is a romance and an inspiration. It is romantic, because it is as full of incident and color as a novel of adventure. It is inspirational, because it shows how a boy of humble origin can rise to fame.

Barney Oldfield was born of sturdy but humble farming parentage, in a little loghouse three miles from Waseon, Fulton County, Ohio. At the time of his birth, January 29th, 1878, his parents were struggling under the burden of a mortgage, on a quarter section of poor farmland which yielded meager returns for their toil. For eleven years, Oldfield remained on the home farm, living the slow, laborious life of the farm youngster of that period, rising at dawn to do the chores, little dreaming that fame and fortune were waiting for him in later years.

At the age of eleven he and his parents moved to Toledo. For four years he attended public school and helped support the family by carrying newspapers. He is still remem-

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bered as a newsboy by some of the old inhabitants, who bought the Toledo *Blade* and the Toledo *Bee* from the future racing champion, then an unknown barefoot urchin.

When his summer vacation came in 1892, Oldfield worked as a water boy with a railroad section gang. At this period he developed the love of speed which was to be his guiding influence through life, saving forty-five dollars to buy a solid-tired bicycle, the "Advance," on which he practised with the ultimate hope of becoming a racer. On going back to school that fall, he found that practical things interested him more than learning, and he decided to give up his studies. Willing to take whatever came first to hand, provided it gave him an honest living, Oldfield donned a white apron and jacket and waited at table in the Toledo Insane Asylum. A little later the white apron was discarded for a bell-hop's brass buttons and uniform, and for a while he chased up and down stairs with ice water in the famous old Boody House. Then he switched over to the more modern Monticello Hotel, where he became elevator boy.

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But an elevator, while it offered a certain amount of risk, was not an ideal speed vehicle for Barney Oldfield, and with the tips he collected, he managed to purchase a "Dauntless" bicycle, equipped with pneumatic tires.

And thus, for the first time, Barney found himself riding on air. He had found his true vocation. To satisfy his craving for speed, he used to rise at dawn, when the streets were deserted, and burn up the boulevards at a pace which seemed to justify his hopes of later becoming a racer.

In the spring of 1894, he purchased a real racing wheel, the "Royal Flush," and made his début as an amateur rider in an eighteen-mile road race, held on May 30. He won second place, and second time prize. This encouraged him to enter other races, but he got more spills than trophies. One of his accidents resulted in two broken collar bones.

Dividing his time between running the elevator and riding the bicycle, he became an experienced rider, and in 1895 participated in the Ohio state championship races at Canton, riding a "Dauntless" and finishing second in

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the three leading events, winning two silver medals and a gold watch.

By this time Oldfield was a husky youth of athletic build, with sound mind and muscle, and something of a local reputation. He forsook the hotel job and went to work as a bicycle repairman and salesman. It was at this time Barney Oldfield developed an ambition to become a pugilist. Dan Bailiff, a Lima heavyweight, undertook to train him with an idea of making him an aspirant for middle-weight honors, but Barney overworked himself and fell a victim to typhoid. By the time he was cured, the fighting bugs had also been eliminated from his system.

In 1896 Oldfield signed a contract with E. C. Stearns and Company to join its team as a paid amateur and ride one of its yellow bicycles. He was a decided success, and captured most of the open prizes for which he competed. The result was that for the next three years, first as an amateur, and then as a professional, he followed the bicycle racing game, becoming one of the big figures in the Middle West and, subsequently, in the East.

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Successively he rode a "Racycle," "National Chainless" and "Tribune."

In 1902, Oldfield met Tom Cooper, who was destined to play an important part in his life. Cooper, a former bicycle champion, had forsaken the bicycle game and formed a partnership with Henry Ford, then an almost unknown electrician and mechanic in Detroit. They two were engaged in their historic, though then derided efforts, to build the two high-powered racing automobiles subsequently known as "999" and the "Red Devil."

When Cooper offered Oldfield a job as head mechanic, Barney saw his chance to break into the automobile game, and immediately answered the call, having foresight enough to realize that the motor was destined to supersede the bicycle as a speed and racing vehicle.

The "Red Devil" and "999" were ghastly failures in their first tryout, and Ford, in disgust, sold the two cars, together with the shop and equipment, to Oldfield and Cooper for \$800. They rebuilt the cars and shipped them to Cleveland to make their *début* in a

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meet promoted by Carl Fisher and Earl Kiser. The "Red Devil" wouldn't run at all, and old "999" was so balky and headstrong that she required a crew of three men to keep her going. "Spider" Huff acted as driver, Cooper rode as mechanic, while Oldfield perched on the rear of the car, blowing pressure into the gasoline tank, with no other pump than his own lungs and a rubber tube. In this comic manner did Barney Oldfield enter the field in which he was destined to win world-wide fame. They got twenty-five per cent. of the gross receipts for entering the race, but as they won no prizes, the meet netted them only a few dollars.

Nothing daunted, with borrowed money they worked old "999" over, and shipped her to Detroit. It was then against the law to drive an automobile through the city streets, so they towed her behind a borrowed horse out to the Grosse Point track.

While awaiting the day of the race, Oldfield got an opportunity to experiment a little on his own hook, and discovered that he could get more speed out of "999" than either Huff

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or Cooper. So they decided he should drive against Alexander Winton and his famous "Winton Bullet." The promoters of the race offered a purse of \$200 on the side to any car that made a mile in that race, in faster time than the "Bullet."

The race was run on October 23, 1902. "I confess that I was a trifle timid and a little bit frightened," Oldfield said afterwards. "I remember how a friend of mine came to the car just before the start and said,

" 'You'd better be careful, Barney; you know you are liable to be killed.' "

"I thought a moment, and then remembering that my pockets were empty, I managed to reply,

" 'Well, I might as well be dead as broke.' "

And Barney Oldfield, competing against the fastest known car and an experienced racing driver, not only won the race, but the \$200 purse as well. His fastest mile was one minute and four and four-fifths seconds. His time for the five miles was five minutes and twenty seconds. His success won him immediate fame for it was due more to his daring

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and ability as a driver than to the superior excellence of the car.

On December 1 of the same year, on the same track, Oldfield beat the Winton time record, driving a mile in one minute and one and one-fifth seconds. William Parrett had promised him \$250 if he would break the record in "999" using Diamond tires, but Parrott held up the money until the record was accepted as official by the American Automobile Association.

Fame alone wouldn't buy grub, and Oldfield went to work as a mechanic at two dollars a day with the Yale Automobile Company. A short time afterwards he became a bicycle salesman, making a living until the following spring, when he went to Detroit to join Cooper and overhaul "999" and the "Red Devil" for the coming season.

On Memorial Day Oldfield drove "999" on the Empire City track at New York, winning over Charles Wridgway in a "Peerless," and making his fastest mile in one minute and one and three-fifths seconds. This was officially recognized as the world's record, his

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previous exploit for Parrett never having been accepted as official. Oldfield won forty per cent. of the gross receipts that day and was presented with a silver championship trophy. Oldfield immediately went back to Ohio with this prize money and paid off the mortgage on his father's house.

The famous "Ford Feud" race between Oldfield and his old partner, Tom Cooper, followed shortly afterwards. At Indianapolis Barney won the five-mile event easily, and, as the track was fast, the promoters and officials asked him to try to establish a new time record. Carl Fisher went into the grandstand and collected a purse of \$250 which was to go to Oldfield if he covered a mile in less than sixty seconds.

"Hang the money on the post," said Oldfield, "and I'll make one minute flat look sick."

He drove the mile in fifty-nine and three-fifths seconds, being the first auto driver in the world to establish a mile-a-minute record, one of the exploits which looms large in the

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catalogue of deeds which contributed to his lasting fame.

In subsequent races in Ohio, Indiana and New York, he brought the mile record down to fifty-five and four-fifths seconds, and in August defeated Frank La Roche, driving a French Darracq, in two straight heats of a five-mile race, establishing a new world's record of four minutes and fifty-five seconds for five miles.

At this point in his career, Barney and old "999" parted company. Alexander Winton, returning from Europe after an unsuccessful attempt to win international honors in the Gordon-Bennett trophy, persuaded Barney to sign a contract to drive the "Winton Bullet." He went to Detroit, and driving the "Bullet" defeated Tom Cooper again, subsequently entering a free-for-all ten-mile contest in which he met with his first automobile racing accident, blowing a tire on the seventh lap, crashing through a fence and killing a spectator. The driver, however, escaped with a few cuts and bruises, while the car was not seriously injured.

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A Pacific coast trip followed, and after driving exhibitions at various western points, on November 22 he lowered the world's one mile record to fifty-four and four-fifths seconds, driving the "Winton Bullet" at Los Angeles.

Next followed Oldfield's historic triumph on the sands of Daytona Beach, in Florida. He competed against William K. Vanderbilt, Foxhall Keene, Samuel B. Stevens, Henry L. Bowden, and other millionaire amateur sportsmen who had spent a great deal of money for expensive foreign cars and some of whom drove with daring and ability. But Barney conquered them all, including even the "Fiat" and "Mercedes."

Incidentally, on the sand straightaway, the fastest track he had ever known, he established a new competitive one-mile straight-away mark of forty-three seconds.

Laurel-crowned and world-famous, Barney returned to the dirt track in the spring of 1904, and drove in exhibitions at New Orleans, Philadelphia and other points. Going to Boston for the Memorial Day meet, the

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“Winton Bullet” ended its career by catching fire and disappearing from mortal ken in a blaze of flame, like Elijah’s chariot.

The ill-fated “Green Dragon” came next. Oldfield’s contract to drive this car, which had been an unsuccessful contender for the Gordon-Bennett trophy, was made with M. P. Mooers, engineer of the Peerless Company. Oldfield drove it in only two meets. In the first he defeated Earl Kiser and Charles Grant driving “Wintons” at Detroit. In the second he pitted it against Alonzo Webb’s “Pope-Toledo” in a race on the World’s Fair track at St. Louis. Oldfield became blinded by dust and went through the fence. Two spectators were killed, several others injured, the “Green Dragon” completely demolished, and Oldfield himself was laid up in a hospital with broken ribs and a punctured lung.

But after a month’s enforced idleness, Oldfield was ready to challenge the world again with a new “Peerless Green Dragon.” After defeating Alexander Winton and Earl Kiser at Cleveland, he went to New York and scored his first big international victory, defeating

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Thery and Bernin, French racing stars, and Sartori, the great Italian driver, in two straight ten-mile heats, and establishing a new ten-mile record of nine minutes and twelve seconds.

Another western tour followed, and when Oldfield shipped the "Green Dragon" back to Cleveland for a winter overhauling, he held all the world's dirt track records. He had defeated all comers, and was the greatest speed king in the world.

For three splendid years he continued his triumphant career, driving the "Green Dragon," and never meeting defeat. His first defeat came in Chicago when Webb Jay, driving old "Whistling Billy," beat him under the wire in a ten-mile race won in the comparatively slow time of nine minutes and forty-nine seconds. Later, in St. Paul, Oldfield had the satisfaction of getting revenge on Webb, but was beaten by Earl Kiser with a "Winton Bullet" in a five-mile race. It was in this meet that Oldfield received two thousand dollars appearance money, the largest bonus ever given a driver up to that time.

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The last serious accident Oldfield ever suffered came soon afterward on the Grosse Point track, Detroit, when another car crashed into the rear of the "Green Dragon." It went through the fence, but Oldfield escaped with bruises and scalp wounds. Later, with his head swathed in bandages, in the same car which had been repaired and improved, he established a new world's five-mile record at Cleveland, covering the distance in four minutes and forty-five and three-fifths seconds.

In 1905, Barney Oldfield, by this time a famous figure in the sporting world, became an actor, and supported Elsie Janis in "The Vanderbilt Cup," a musical play produced at the Broadway Theater. He had the satisfaction of seeing his name shine in enormous electric lights on the "Great White Way." The show was a great success and played to S. R. O. for ten weeks.

In the spring of 1906 he made a southern racing tour, and then, the San Francisco earthquake breaking into his racing plans, he went on the road with "The Vanderbilt Cup" for ten successful weeks.

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The year of 1907 he spent as an exhibition driver, and in 1908 decided to retire from the game. While attending the automobile show in New York, he sold his two cars, the "Green Dragon" and the "Blue Streak," and attempted to enter the automobile industry, but was unsuccessful. He couldn't get hold of a business proposition that looked big enough.

The lure of the track called him back the following year and he accepted a contract to drive a ninety-horsepower "Stearns," owned by Harlan W. Whipple, president of the American Automobile Association. He was defeated by the Italian, Ralph de Palma, at the wheel of an "Allen-Kingston," on the Readville track, Boston. Realizing that Whipple's "Stearns" was not suitable for dirt track racing, he had two special "Stearns" cars built, defeated De Palma in a race at St. Paul, and gave exhibitions in the west. On these cars he used "Firestone" tires for the first time.

After trying a six-cylinder "National" in 1909, he switched his allegiance to a foreign car, and bought the 120 horsepower "Benz" which was to prove the most consistent racing

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car he ever owned. In the first race in which he drove it, he defeated De Palma and Len Zengle, and set a new world's record for ten miles. By the time the 1910 season opened he had smashed practically all track records in the "Benz."

In the spring of 1910, on the Daytona-Ormond Beach, driving a second "Benz," the historic 200-horsepower "Blitzen Benz," he astounded the world by establishing four new international straightaway records, in by far the lowest time ever made. His average speed for the flying kilometer test was 132.04 miles per hour. The wonderful nature of this performance is more obvious in the light of the fact that up to that time Oldfield had never driven as much as 100 miles per hour. In practice driving later he traveled at the rate of 150 miles an hour.

Driving this car he won races and broke records all over the country and reached the zenith of his brilliant career. At the Indianapolis Speedway on May 30 he shattered the American records for a kilometer and a mile,

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making these distances in 21.45 and 35.63 respectively.

Then came the unfortunate Jack Johnson incident which temporarily cast a shadow over Oldfield's fame. The negro prize fighter, after knocking out Jim Jeffries, had imported a "Renault" roadster, and announced to the world that he was as great a driver as he was a prize fighter. Oldfield challenged Johnson and the negro accepted. The American Automobile Association contest board informed Oldfield that he would be suspended if he competed in such an event. Barney ignored the warning, defeated Johnson at Sheepshead Bay, and was blacklisted. For more than a year he was an outlaw in the automobile racing world. Tired of fighting the association, he finally sold the "Benz" and accepted a position in the sales department of the Firestone Tire and Rubber Company, in which he had invested most of his racing profits. Oldfield sacrificed himself, in racing against Johnson, in order, as he believed, to uphold the supremacy of the white race in the sporting world.



Barney Oldfield in the Blitzen Benz with which he lowered so many world's records

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He felt that if he did not defeat Johnson, the negro would become too arrogant a factor in sporting circles.

Oldfield's subsequent comeback in 1912, when he was finally reinstated by the American Automobile Association, is one of the most splendid chapters in his history.

Inside of a year he won back all his lost prestige and reached new heights of fame. His consistent and sensational driving, on tracks and in road races, made him the big factor in the 1914 season, and his services were in such demand that he was on the payroll of three companies, the Mercer, Stuz and Maxwell. Driving cars of these makes he was always great, though not always victor. Added to his splendid showings in the Vanderbilt Cup race, the Indianapolis speedway contests and other classic races, he scored the greatest victory of his sensational career in the fall of 1914 when he won the most tortuous road race in the annals of the world, the famous 696-mile Cactus Derby. For three days he set the pace and led the field from

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Los Angeles to Phoenix, finally establishing his right to the title of "Master Driver of the World."

Two weeks later in the Corona road race he established a new world's non-stop record of 301 miles, sharing honors with Eddie Pullen who carried off first money.

When the 1917 racing season opened Barney created a sensation by bringing from California his "accident-proof" car which was immediately dubbed the "Golden Submarine." This car was touted as a possible three-miles-a-minute speedster. It was entirely enclosed, shaped between an egg and a submarine. The body was electrically welded aluminum, supported by rigid steel braces, and its chief distinction came through a claim that it could overturn without injury to driver.

The "Golden Submarine" was built in Los Angeles by Harry Miller, a skilled engineer. Barney assisted in the designs and in the manufacture of the car. It is a high-speed four cylinder type engine, built entirely of aluminum—in so far as possible. It cost Barney more than \$15,000 and was one of the finest



Barney Oldfield's "Golden Submarine" in action

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and most wonderful special racing jobs ever turned out in America. It was given its baptism in competition at Chicago over the Speedway, but was so new and green it did not show as well as expected. It had early speed and gave promise of developing into all that had been claimed for it.

At the start of the race over the Chicago Speedway Barney got away in third place. Ralph De Palma was in second and took the lead in the first lap. Barney was at his heels, but in the third lap Oldfield rushed past DePalma and took command. His golden car streamed along in front for several miles, making ten in 5 minutes, 43.5 seconds, an average speed of 104 miles per hour. He suffered tire trouble and lost the lead, finally retiring from the race in the twenty-fourth lap through broken valve spring caps. Barney had his second car, a "DeLage," in this race with Durant driving and took third money with it.

In the race run at Cincinnati on Memorial Day Barney was unable to start the "Golden Submarine," but drove his "DeLage." After

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being in front most of the time and fighting De Palma and Chevrolet for the lead mile after mile, he was forced to drop back because of troubles. At the sixty-mile post Barney was in the lead, but his car went back on him until it was a hopeless task. The "Golden Submarine" was started in other speedway events, but never developed the speed it showed at Chicago.

But on the mile dirt tracks Oldfield came into his own during the season. He was matched with Ralph De Palma for a series of races and started them with an easy victory at Milwaukee. De Palma turned the tables at Detroit, but at Providence Oldfield came back and beat the Italian in the hardest, fastest races ever run on that course. During the match races between De Palma and Oldfield many world's records and track marks were broken by the two stars. Oldfield won four out of six of the match events, De Palma getting the verdicts at Detroit and Atlanta and Barney at Providence, Milwaukee, Indianapolis and St. Louis.

On August 9, two days before the match

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with De Palma at St. Louis, Oldfield took the "Golden Submarine" out and, under a special sanction with electrical timing, broke all the world's dirt track records from one to fifty miles. In the match with De Palma he broke the competition records also. The full list of records set by Oldfield at St. Louis follows:

1 mile . . .	:45	10 miles . . .	7:56.2
2 miles . . .	1:30.4	15 " . . .	12:00.8
3 " . . .	2:17.6	20 " . . .	15:52.2
4 " . . .	3:05.6	25 " . . .	19:57.6
5 " . . .	3:53.6	50 " . . .	40:47.6

Following the series of victories over De Palma, Oldfield started at Uniontown in the fall races. He was leading the field by a big margin when he smashed his car and narrowly escaped death. In Atlanta Barney had a narrow escape from death when a wheel collapsed and his car skidded back and forth across the track, being finally brought to a standstill up against an inside fence. The infield of the Atlanta track is a lake and had Oldfield not kept his car in control he would have been drowned by going through the inside fence and into the water. He was driv-

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ing the "Golden Submarine" and its door was jammed in hitting the fence so that it had to be pried open before he could get out.

Barney was challenged by Louis Chevrolet for the dirt track title late in the fall and defeated the Frenchman after several hard races at Birmingham, Chattanooga, New Orleans and Los Angeles.

More recently Barney Oldfield has devoted more time to business than to racing or exhibition driving. As a business man he is making a success just as he did in the world of speed. The small fortune he earned at the wheel is well invested. He owns stocks that have a value well into six figures, and has a café in Los Angeles, in partnership with Billy Kipper, which is proving a good paying investment. As an automobile expert he also writes frequently for newspapers and magazines.

Barney Oldfield will go down in history not only as a daring and successful driver, but as one of the greatest race track generals who ever lived and a practical automobile expert who has few equals.

HOMER C. GEORGE.

BARNEY OLDFIELD'S BOOK FOR THE
MOTORIST

BARNEY OLDFIELD'S BOOK FOR THE MOTORIST

CHAPTER I

BUYING THE NEW CAR

THOUSANDS have asked me to advise them what car they ought to buy. Of course I can't do that, but I am going to give some general directions as to certain precautions that should be observed in buying a car, no matter what sort of service it is intended for.

The first piece of advice I want to give my readers is to buy a car that is manufactured by a company that is perfectly solid financially. This does not mean that the company must not be a new one, because lots of the newcomers in the field have perfectly sound financial backing. But unless the manufacturer is of recognized permanence in the field, he ought to be looked up as to financial stand-

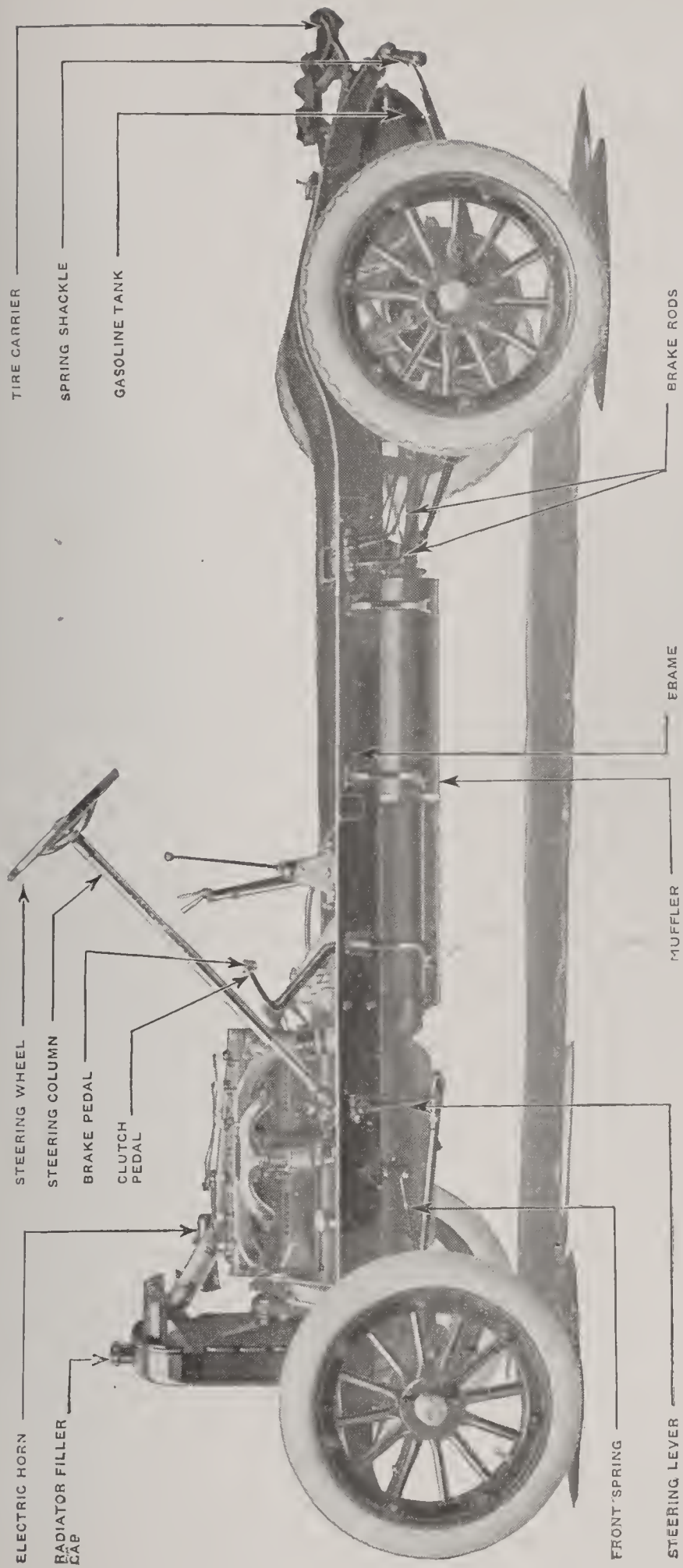
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ing before placing an order with him. The reason for this is that when a company goes out of the business of manufacturing, its cars become what are known as orphans and it is difficult and expensive to buy spares in case of accident.

The question of price is one that settles itself. The prospect must simply make a list of the cars that are within the limit that he can spend and from these he must have his choice.

After I had determined that the manufacturer was going to stay in business to give me spares and factory service, I would look into the standing of the dealer. See whether he has the reputation of giving good service. You can find this out in a hurry by asking some other user in town as to what treatment he gets. If the dealer is unprogressive and has not the facilities for carrying out repairs promptly, you will hear of it from some of his patrons.

Now in settling on which car to buy, there are certain obvious precautions to be attended to. If you have a large and enthusiastic family of children, you had better not invest in a



Chassis of a modern car showing major parts with which every owner should be familiar

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two-seater, sport model; that is if you value your life. On the other hand a crabbed old bachelor will have little use for a seven passenger touring car. Of course the normal man's common sense will rule in this case and I just mention the matter in passing.

The prospective purchaser ought, of course, to take into consideration the type of service he will probably demand of the car. If he lives in a hilly country, the car must have plenty of power, and the gear ratio suited to the country. Any car purchased ought to have good acceleration qualities, flexibility and a moderate turn of speed. For the ordinary family car, which is to be used as a general vehicle for the household, care should be exercised to select a car that is sturdy and durable rather than one with one pronounced feature only. Remember that a car that is laid up half the time is only half a car, to say nothing of the expense for repairs. A flexible car is one that will throttle down to a low speed on high and at the same time be able to make fast time when called upon. If you put the high gear range at four to fifty or more

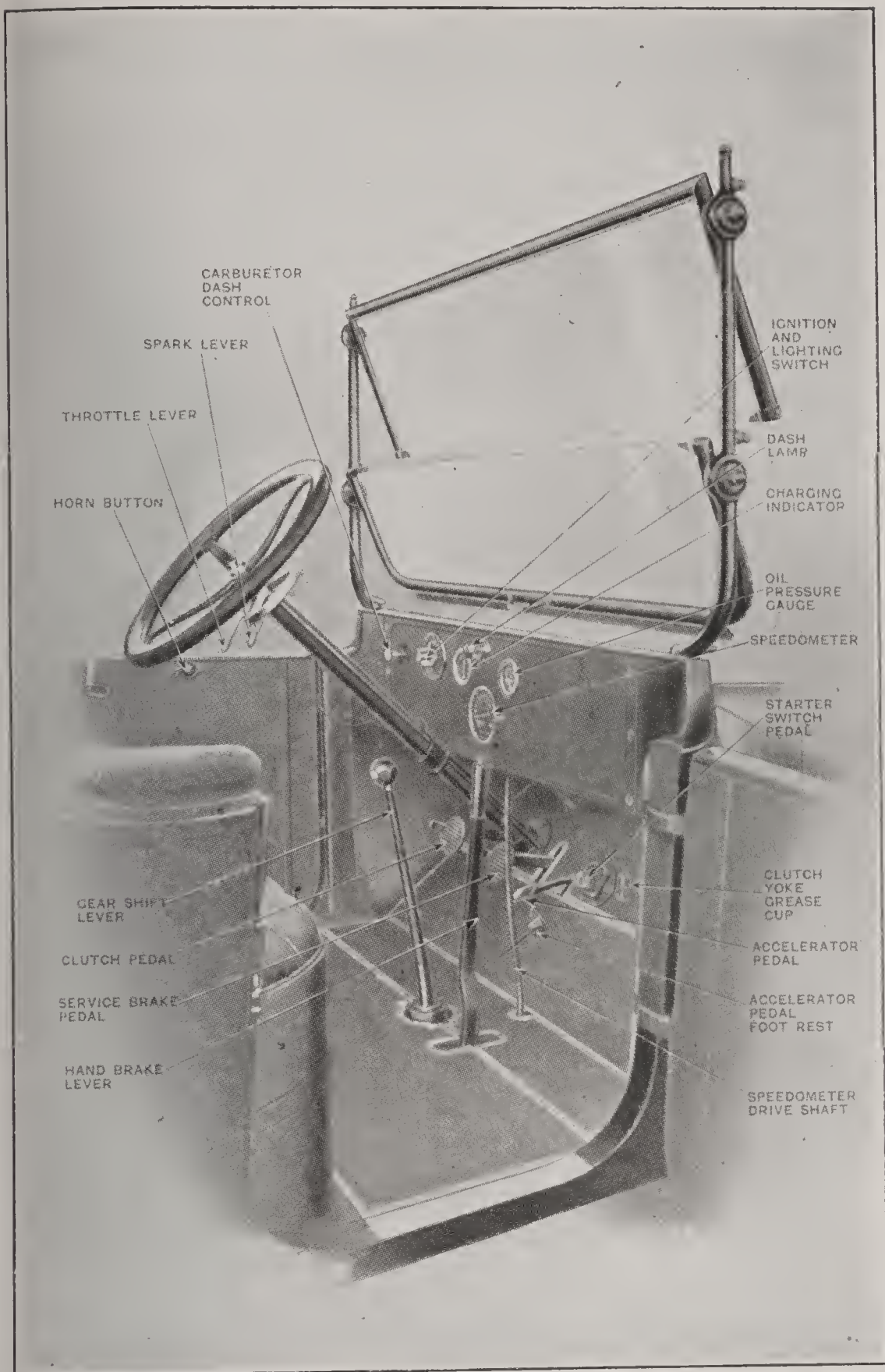
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miles an hour, you are naming a flexible car.

The matter of accessibility of parts ought not to be neglected. Every part of the mechanism that is going to need attention, cleaning, lubricating, etc., ought to be in such a position that it can be gotten at easily. Look and see whether the oil and grease cups are so placed that you can get at them without being a contortionist. See if you are going to be able to drain the differential housing and flush it out and refill it without wrecking yourself for a week. See if the adjustments to the brakes are easy to make.

Next glance over the accessory equipment of the 'bus. Is the ignition system a good one? How about the carburetor? Is there a good air pump fitted? What about the fuel feed system? Make sure that the manufacturer has not tried to skimp through by fitting cheap accessories.

When it comes to the mechanical details, the average car buyer will find himself in some doubt perhaps. He ought to be sure that the various units in the assembly are big enough and strong enough to stand up to their



Layout of instruments and driving mechanism in a typical front compartment. This will vary slightly in different cars but each manufacturer will have every item shown here arranged somewhat similarly for the driver. Study the layout in your instruction book

Buying the New Car

job. Gears, bearings, shafts, etc., must be full sized and able to stand the gaff. Most of this will have to be judged by the reputation of the maker.

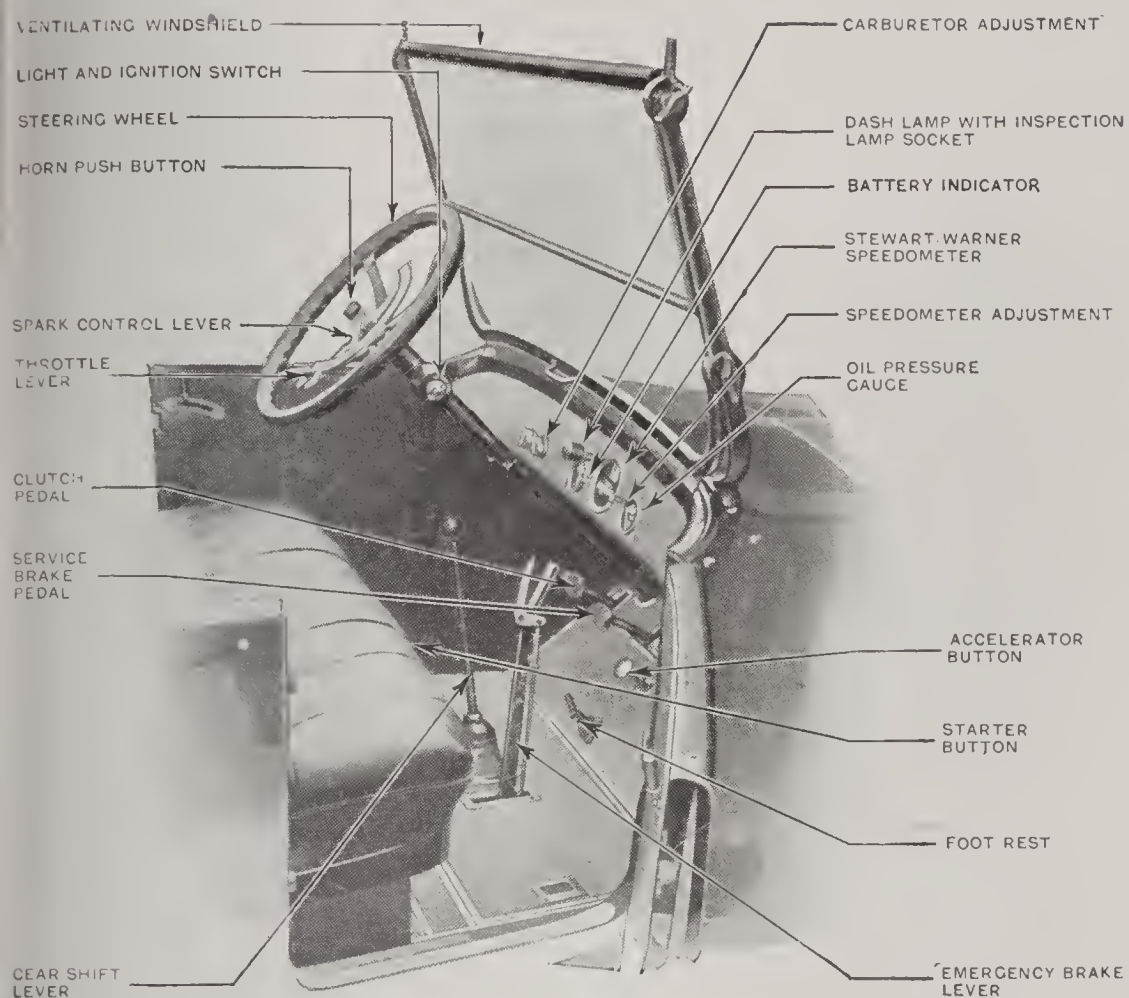
As a matter of fact the average buyer will be absolutely unable to pass on these points. The only safe way for him to do is to make extensive inquiries among owners of the car he is considering and find out whether they are satisfied. You can gamble on it, that if the car is undersized in some of its parts, owners will have plenty of complaints to make. If you find the car is sort of "delicate," if it has to go to the shop frequently for overhaul or repairs, sheer off and try another make.

Now for the man who is buying his first car, all this makes a pretty good sized problem. He cannot pass on the various mechanical elements that go into the make up of the vehicle. He cannot determine from the demonstration of the car in the hands of the agent's expert driver, how it is going to act when he takes the wheel himself. Take the flexibility test; it is the easiest kind of a thing for a foxy driver to fool the inexperienced prospect and to

Barney Oldfield's Book for the Motorist

give him a demonstration of speed three miles an hour on high, when in reality he has slipped the clutch on the novice. The man who knows nothing about automobiles ought to enlist the help of a trustworthy person who is an expert, paying him for his time if necessary and taking him with him on driving demonstrations and for an examination of the car. It is better to pay a skilled mechanic \$10 to assist in making a good selection than to buy in the dark and find you've been stung.

When you stroll down the row to buy that new boat, just remember that it is more than a pleasure that you are investing in; it is part of your general efficiency. You ought to be just as careful about investing \$1,000 in an automobile as in any other kind of a business investment and, believe me, it will pay you bigger dividends than almost any other kind of investment.



Another type of driving and control mechanisms

CHAPTER II

STUDY YOUR INSTRUCTION BOOK

HALF the new cars sold annually in America suffer a twenty-five per cent. loss of life during the first sixty days of their use. This statement seems astounding, but it is based on the experience and observations of manufacturers and dealers the country over. Therefore my plea:

HANDLE YOUR NEW CAR WITH AS MUCH CARE AS YOU GIVE YOUR BABY.

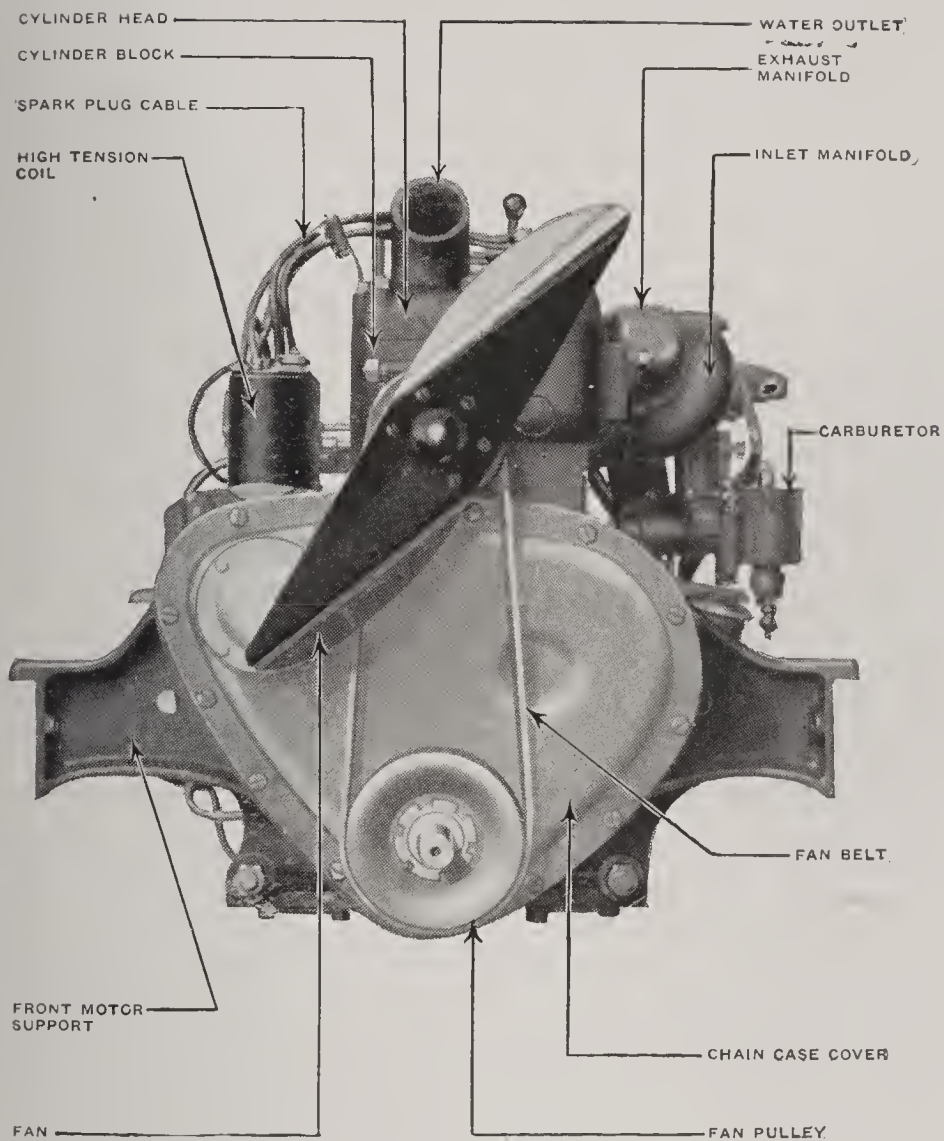
Seemingly few persons realize the importance of careful driving, inspection and upkeep during the initial period of a car's use. They seem to take it for granted that they may do *anything* with the new car that may be done with one used for months. They abuse it heedlessly through fast driving, hard pulling and neglect. The result is deterioration.

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The first word of advice I wish to give to new-car owners—and this might be taken to heart by all other owners—is: *Study the instruction book which the manufacturer places in your car.*

Do not merely glance through this book or read it carelessly, but study it with a view to understanding it. Keep at this study until you have thoroughly absorbed the general advice and suggestions, even if you fail to grasp the more technical information it contains. Every manufacturer gives hints as to the care of cars and the proper method of driving, which are worth while.

I have known many owners who had a surface knowledge of cars—their care and driving—who expressed the greatest surprise at the value of the suggestions in their instruction book when they happened to read them at odd moments. In many instances these owners then began a systematic reading of the manufacturer's booklet. I have never yet talked with one of these owners who did not give thanks to the company and who did not get many valuable pointers. And some were



Front view of an engine showing various parts of the motor

Study Your Instruction Book

men who had been driving for several years!

Aside from the reading of the instruction book for general suggestions of a non-technical nature, study the book to learn all you can possibly absorb as to the functions to be performed by the many parts of the car. Study to learn the relationship of all the various parts to one another. In other words, study to learn your car.

Do not tear your car to pieces to learn something of it; but trace out the various systems and the relations of each to the other. Do not attempt to pull apart the electrical system, but learn to trace the wires so that you have a fair knowledge of each. Gradually increase this knowledge. You will find a wiring diagram in your booklet and, if you will give it careful study, it will be found simple and your gain in knowledge will enable you to avoid trouble.

When you have a bit of knowledge of your car and have drilled into your mind the points on driving suggested in your book, you may take your car on the road. Of course, if you have never driven a car, you will need instructions. Your dealer will provide a teacher,

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who will instruct you in the rudiments of driving. Then handling a car is merely a matter of confidence and keeping cool and well-controlled. Gradually you may apply the suggestions as to the finer points of driving as you gain in confidence and get used to handling your car.

In the beginning, though, the greatest demand upon the driver is:

DON'T SPEED.

At all times the cost of speeding is as immutable as the law of death; but when a car is new the costs are trebled through the dangers of damaging bearings and other parts before they are thoroughly worked in and the motor given the polish and glaze essential to efficient use. As a matter of fact, no new car should be driven faster than twenty-five miles an hour for the first thousand miles. Meanwhile, it should be watched, inspected and cuddled like a baby.

While breaking in your new car and getting it to work smoothly, be sure to see that it is always well-lubricated. A new car requires more oil than after it has been used a

Study Your Instruction Book

thousand miles. The importance of this cannot be stressed too much. Not only does the motor require more oil, but the grease cups should be given more attention and every part given lubricants in abundance.

The two points I mention here are merely the most pressing cardinal principles of car operation and are given in connection with the plea to study your instruction book published by the manufacturer of your car. If they seem to be repeated in later parts of this book, it will be because they naturally fit into the matters under discussion.

CHAPTER III

BREAKING IN THE NEW CAR

I HAVE had occasion to notice from time to time that when a man buys a new car he seems to think that, being fresh from the maker's shop, it is so strong and supple that he can do anything with it, without damaging the vehicle in any way. Now there was never a bigger mistake on earth. The new car is more delicate by far than its brother that has been run for five or six thousand miles.

The first few months of the car's life in active service are the most vital of its whole career. It is undergoing what is known as "running in." The closely fitting parts are easing up just a bit and unless they are treated with consideration until this process has been accomplished, irreparable damage may be done to the whole mechanism.

Another mistake that most new owners make

Breaking in the New Car

is to assume that the new automobile as it comes to them is absolutely ready for the road. This may be true, probably is, but there are exceptions enough to make it worth while to give the entire vehicle the "double-o," before taking it out on the road.

For instance, in a factory where several hundreds of cars are shipped each day, it is a very easy mistake for the man who is charged with attending to the lubrication to overlook one unit, thinking probably that he has already attended to it. The owner, all unsuspecting, jumps into the new 'bus for a ride and the first thing he knows the part which was not lubricated, gets hot. Many a first day's ride in a new car has been spoiled by just such an oversight. The first thing I would recommend for the new owner is carefully to go over the lubrication system and see that each unit has been provided for in this respect. Sometimes it will be found that the transmission and the rear axle housing have been filled with grease. I would remove that and substitute a gear oil.

The next part of the equipment that I would

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inspect would be the battery. It is not impossible, in these days of long freight journeys, that a battery which leaves the factory in perfectly good shape, may reach the car owner considerably weakened. Therefore take your hydrometer and test each cell in turn to see that it measures up to the required specific gravity. If the new owner doesn't understand how to take hydrometer readings and hasn't got a hydrometer anyway, he had better have the battery service station test the battery for him. At any rate, get it done. Also see that all the cells are up to the proper level with fluid; if any of them are below the mark, fill them up with distilled water.

After these two matters have been attended to, the tires should have the benefit of a looking over. In his haste to get the car into your hands, so that you won't be calling him up on the 'phone four times a day to ask when you are going to get it, the agent may have forgotten to put the proper pressure in the casings. Sometimes even the brand new valve may have a slow leak in it, so that while the tire started out fully pumped up, it will be away below

Breaking in the New Car

pressure by the time you get it. At any rate test every tire with a gauge and make sure you have proper pressures before you drive off in the new "boat." A single afternoon's running on a badly underinflated casing may be enough to ruin it for good and all.

Now when it comes to driving the new car there are some things to keep in mind. The new driver should remember all the time that throughout the new mechanism under his control intensive movement is going on in all the parts. At first the parts may fit so tight that lubrication is a little difficult at best. Therefore, don't attempt high speed, until the various parts have had a chance to wear in. Do not race the engine, nor make it do an excessive amount of work. Give it a chance to cut its eye teeth before you abuse it.

Don't try to see how far you can throttle down on high gear. Don't try to take all the hills you come to in high; drop down to a lower gear, until the mechanism is running easier. Don't reduce the lubrication simply because the engine smokes a bit. When she is smoking you can be sure at least that the

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parts are getting plenty of oil. Don't be surprised if the car uses a good deal more gasoline than the agent promised you it would. This doesn't mean, necessarily, that the agent was telling whoppers. The stiff mechanism wastes power and uses extra gas to make up for this condition. After the car has loosened up, you may even find that you can readjust your carburetor, so as to burn much less gas.

After the new car has been in service for five or six hundred miles, the condition of the starting and lighting system ought to be investigated. The charging rate for which the device has been set may not be suited to the particular service you demand of the vehicle. If the owner does not understand how to check up this unit, he had better call upon the service station for help.

When the car has been run for a week or so, it ought to be gone over for loose parts of various sorts. Nuts and bolts may have been shaken loose, the spring clips may have stretched a bit. At any rate go over the whole mechanism with the idea in mind of finding

Breaking in the New Car

parts that have been loosened by the vibration.

It will generally be found that the clutch of the new car demands some favoring. The common practice of slipping the clutch ought not to be resorted to. Engagement and disengagement ought to be gradual and easy. This same advice applies to the gears. These will naturally be stiff and they must not be jammed into engagement with all the force of the driver's arm. Favor them a little until they have had a chance to work in.

Not only the mechanism of the new car but its body finish as well need care. The lustrous enamel of the fine new body is beautiful to look upon, but it has not yet firmly "set." Mud spots allowed to dry on it at this stage will produce permanent blemishes. If spots get on the body, the polished surfaces should be carefully washed off with cold water, applied in a gentle stream. After the car has been running for about a month, it is a good plan to apply one of the good body polishes that are on the market.

In conclusion let me again caution the

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owner of a new car not to abuse it in the early stages of its career, for if he does, he will have trouble for the rest of its life, which in itself will be largely reduced by early abuse.

CHAPTER IV

DON'T SPEED; BE SANE

I HAVE been shaking dice with death on race tracks for seventeen years and don't know what it is to be nervous on a course. But when it comes to touring I have been disagreeably scared many times. And all because of the lack of sanity in so many drivers, and the failure of so many to use common sense. I'd rather take a chance with my life any day on a track, than to drive the roads of the country when tourists are joy-riding.

On a track every precaution is thrown about me, yet it is hazardous enough, goodness knows! But when it comes to road driving, the hazards are innumerable at best. With drivers showing absolute disregard of others, these hazards become manyfold. I've had more harrowing experiences and narrow escapes from accidents touring than I've had

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while racing. Every day the list of fatalities due to carelessness and to recklessness is appalling. Laws of the state and laws of the road are constantly violated.

I want to raise my voice in protest against any driving except that dictated by common sense. I want to plead with motorists to show consideration. I want to join with the law-makers in a cry against recklessness. I want to save lives, save cars, save roads, and generally to help make touring a pleasure by pointing out to drivers a few of their faults—faults I have met with in my own experience.

Every little while some law-maker goes on a rampage and tries to have a statute passed to make it harder for the motorist. Almost every day some association, some police magistrate, some superior justice or some leader of the country issues a scathing denunciation of the speedsters. Somehow it seems to do little good. But I am going to try my hand with a plea for bettering conditions. After all, it is up to us who own and who drive cars to do the right thing for our own protection, before others make it too disagreeable.

Don't Speed; Be Sane

The rules of the road are simple. They protect the motorist and the public alike. If drivers will only be reasonable and will follow the rules, the decrease in accidents will be astonishing. I am going to summarize the important rules for driving in the hope of helping the situation. They are:

Always turn to the right. The law not only requires this, but it goes further and demands that you use care in passing another car. Equally, it demands that the on-coming driver use similar care to avoid a collision. You must observe both rules—even if it requires you practically to stop. My way of driving is always to slow down to at least ten or fifteen miles an hour when meeting a car on the open highway and slower if the road is rough and narrow.

Avoid heavier vehicles in so far as possible. Give them as much room as you can. On the other hand, they should pull as far to the right as conditions permit. It is easier for a heavy car to slide off the road than for your lighter car, but they must show consideration too.

Motorists must be watchful of pedestrians.

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Both have the right to use the road, but each must show consideration and care to avoid the other. When meeting pedestrians in touring, always go to the right as far as safety demands.

Be particularly careful regarding horses or other animals. Let the driver of a horse vehicle have plenty of room in which to control his animal, if it should become fractious. Stop your car, if necessary, to avoid either a runaway or a wild plunge.

Legal responsibility is always placed on the negligent.

When some driver comes up behind and signals you, pull over to the right and let him pass. Don't hog the road. It is always better to slow down at such times.

Always slow down for bridges, curves, crossings and for sharp turns. Sound your horn in plenty of time to notify any one who may be just around the corner or the turn of the road.

Don't drive fast—much less speed—in crowded or congested districts.

Don't dash past stationary street cars.

Don't Speed; Be Sane

Don't go wildly around corners or crowd too close to the curbs.

Chief of all, follow the Golden Rule.

Be sensible, be reasonable and be careful.

You will find much more enjoyment in this kind of driving than in any other. Cut out your everlasting disregard for others and you will find the bread cast upon the waters returning in more consideration for you.

Above all, be careful when driving at night. Learn always to switch to your dimmers when meeting another car or vehicle. I have had many narrow escapes from accidents because of the disregarding of this rule. It is astonishing the risks drivers run by leaving their headlights on full when approaching another car. Safety demands switching off at sharp turns as well.

Don't abuse the privileges a spotlight gives you. This light is wonderfully helpful, when properly used, but damnable, when misused. Its free use is sure to be legislated against severely unless drivers curb some present propensities. Always carry the spotlight higher than the other lights. Never flash it on a ve-

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hicle which is approaching—it's blinding. Use it to light up the road surface and to define ditches, but never on another car.

And keep down your speed. In these days when most any car will do fifty to seventy miles an hour, the desire to "let her out" is sometimes hard to resist. But there's no comfort or real pleasure in speeding. It is difficult driving—hard on the man and much harder on the car. You simply cannot avoid accidents if you become a confirmed speedster. You cannot keep your car out of the repair shop either. And you cannot get the natural joy out of driving which you should.

I maintain that twenty to thirty-five miles an hour is fast enough at any time on the road. Try it and you'll get real pleasure out of your motor.

CHAPTER V

LEARN TO DRIVE EFFICIENTLY

FROM fifteen to thirty per cent. of the life of an average automobile is cut off through poor, inefficient driving.

I do not mean that absolute recklessness causes this loss, but the kind of driving many owners consider good. Of course, reckless driving has more to do with the shortening of the life of a car than any other one thing.

But few of the average owners one meets around the country really know how to drive a car efficiently. In many instances they think they are fine drivers, but they know nothing of the real points of driving. They abuse their cars without knowing it. And then they wonder why their gasoline consumption is large, tire mileage small and the life of the car short.

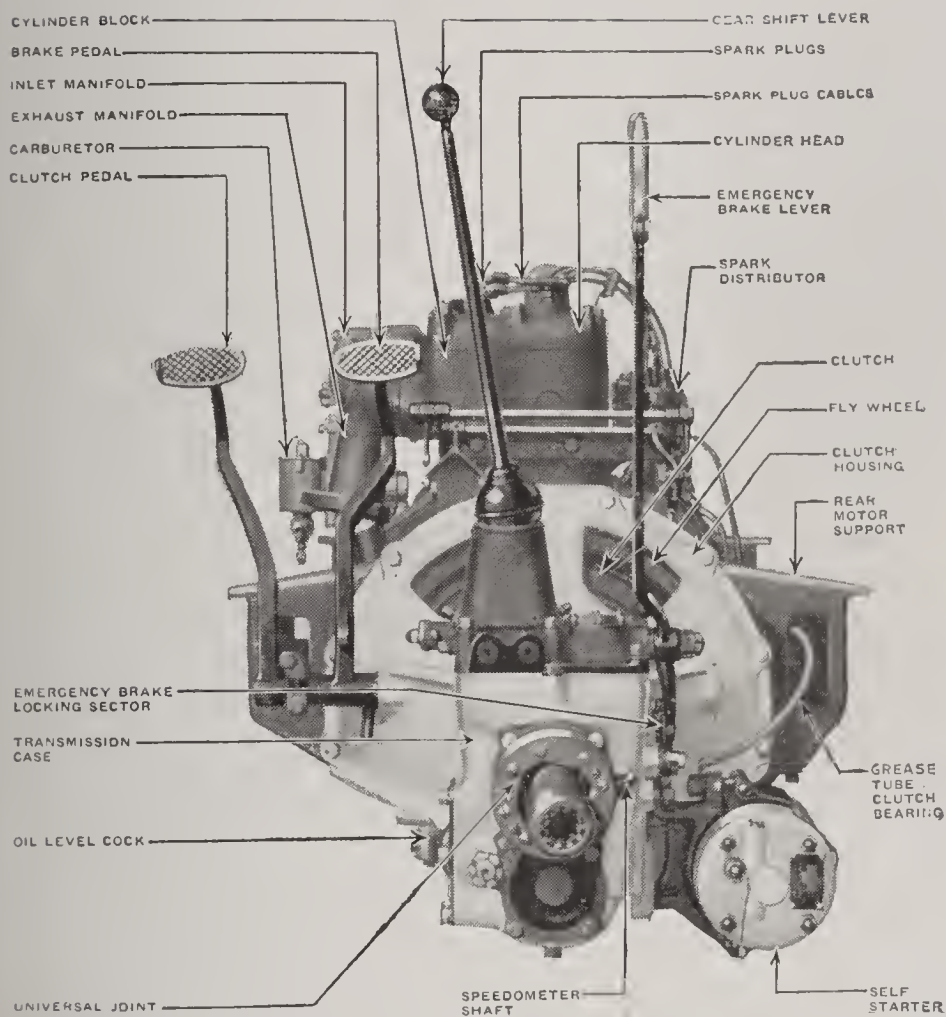
I know one bright young fellow who positively believes he is an excellent driver with

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a fair knowledge of the finer points of motoring. Yet I saw him absolutely wreck a car in one hundred and fifty miles of driving—not one mile of which was faster than fifty miles an hour. What happened?

This young fellow simply drove helter-skelter over good roads and bad. He had bet two hundred and fifty dollars he would make the run within a certain time which called for an average of thirty miles per hour. He jammed his brakes until he burned his linings and ruined a tire. He went into chuck holes like mad and he forced his engine whether the occasion demanded it or not. The result was that he ruined his engine, cracked his frame, shook his radiator apart and generally wrecked his car to such an extent that it cost seven hundred and fifty dollars to replace parts and repair the damage.

I could have driven the same car, over the same roads, in the same time, without injuring it. Any other driver knowing how to handle a car could have done the same thing. My young friend simply did not know anything of the finer points of driving. He had nerve



Front view of motor showing controls

Learn to Drive Efficiently

enough to get the speed but lacked sufficient brains to preserve his car. His case is exceptional, of course, but many drivers do worlds of damage without knowing how they do it.

Here are a few of the things a driver must learn if he wishes to be efficient:

Get the true idea of starting and stopping firmly in mind.

Study your spark from experience in driving and become efficient in using it to the best advantage.

Don't be afraid to change speeds. Don't get the idea that your car is no good unless you can go anywhere in high. Speeds are there to protect the life of the car. Use them.

Practice changing speeds. Get so that you can always make the change without a grinding noise. A good driver can switch speeds frequently so easily that his passengers will not know it.

Use your brakes with care. Don't jam them. Don't use your emergency except in an EMERGENCY. Brake with your engine as much as possible.

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Don't slip your clutch indiscriminately. It gains nothing which good driving would not gain and means wear and tear beyond calculation.

Always drive with your tires properly inflated. It's easy to test them with a pressure gauge and it means many dollars—not only in tires but in the life of the car.

And don't speed. Don't dash around corners on two wheels. Be particularly careful in driving in traffic.

In the last analysis, use common sense. It will mean long life for your car and cheap motoring, with added pleasure.

Let's get down to the first thing every driver should know—proper starting. Use care in starting. Get your engine moving along nicely; go into first speed and slip in the clutch. Move along evenly for a short distance and go into second. Don't hurry, lurch and grind your speeds. Take your time and slip into high. Practice this until you become so proficient that you may start, go through all the gears and sail smoothly away without a single jerk or grind—until you are

Learn to Drive Efficiently

able to do it without a passenger having knowledge of anything except a gradual increase in speed which is natural and easy.

Rough starting may mean a broken rear axle, a loosening of a wheel, a shearing of a key or the breaking of a spring. The driver who follows proper starting will always be able to detect the loosening of a spring clip or wheel and be able to remedy it.

The same thing holds when it comes to stopping. Don't dash madly to any given point, slam on your brakes and stop with a jerk. Know when you are going to stop, lessen your speed gradually and, when the place is reached, ease up as an engineer stops a train.

Study the fine points of your spark. Use your spark control freely. It's there for that purpose and every kind of driving has a spark which gets best results. Nothing but experience will teach this to you. But listen to your engine and learn to manipulate your spark so that the greatest efficiency is obtained without the motor laboring or knocking. In many cases you can control your speed by your

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spark, especially when hill climbing with a well-opened throttle.

Speeds are manufactured for use—not as ornaments. They cost a lot of money and weigh heavily. If they were not needed, the manufacturer would not put them in. So, when driving, don't make your engine labor in order to have the satisfaction of staying in high. Switch to second, or even low, and save your motor. The driver who uses his speeds freely gets fifty per cent. more efficiency than the man who tries to do almost everything in high.

Noise in changing gears is useless. One little point is, always to have your engine going at the same speed your car is moving when changing.

There is absolutely no use in continually jamming on your brakes. Your emergency brake is for use only when in a really tight place and to hold your car while it is standing. Most good drivers even turn their front wheels into curbs to ease up on the use of the brakes. However, be sure that your emergency is right, so that, if called upon, it will perform

Learn to Drive Efficiently

its function positively. On long hills, cut out your ignition and brake with your motor, even if you have to go into first.

This thing of continually slipping your clutch, even in traffic, is uncalled for. Yet the slipping of the clutch in hard going to ease off the strain is essential. Turning corners with the clutch out is also good driving. Use your gears instead of keeping in high and slipping your clutch every second or so.

Incidentally, a good driver is always a man who is reasonable. He never hogs the road; he never cuts in sharply when passing another car; he never scares the life out of pedestrians by sudden, sharp blasts of his signal and he always keeps out of all kinds of trouble.

Be this kind of a driver. It will pay in many ways.

“Keep both hands on the steering wheel and watch the road” should be the slogan of every motorist. I have recently received a particularly sad letter from the mother of a youngster whose smartness in driving with one hand on the steering wheel cost him a terrific shake-up. This mother has asked me to warn

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drivers against the dangers which lie in this style of driving.

Ordinarily one would think that every one would recognize the danger of careless driving, but we frequently err in this respect. It seems to be the desire, of many youngsters especially, to "show off" by reckless driving. One of the pet methods is careless steering. The danger is so manifest that it is hard to reconcile some of the performances one witnesses with the possession of sanity. Hundreds of accidents are due to negligence in steering and the most prominent fault is that of driving with one hand.

It is always well to keep both hands on the steering wheel though the grip should be loose. In country driving one never can tell when a sudden drop into a hole, or a collision with a rock, will thrust the steering wild. If one happens to be going moderately fast at such a time and only has one hand loosely holding the steering wheel, he will be lucky to escape an accident. Many a car has been ditched in just this way.

Don't let your car suffer from this negli-

Learn to Drive Efficiently

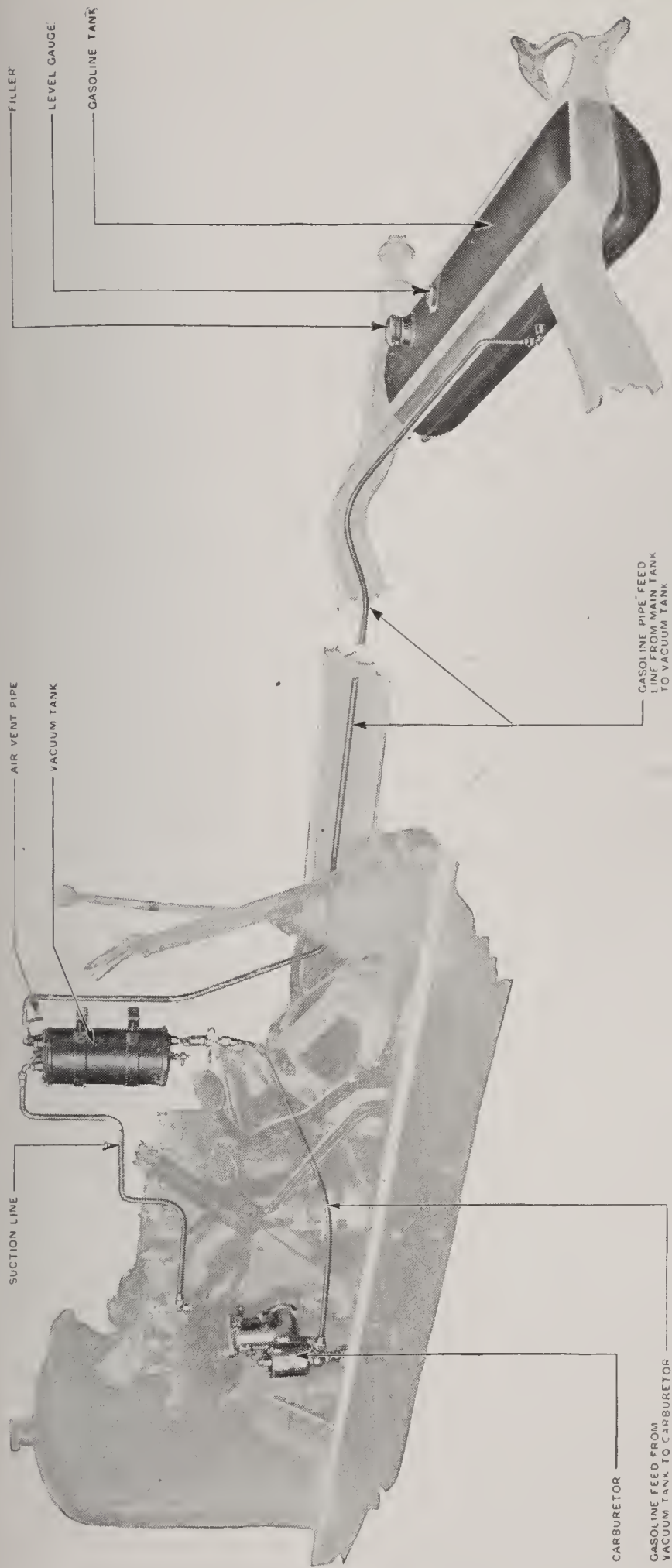
gence. Keep both hands on the steering wheel. Watch the road, and always keep complete control of your car. Thus you will avoid accidents and expensive repairs.

CHAPTER VI

PRACTISE ECONOMY IN DRIVING

PRACTISE economy and be sane about it. Don't be a waster. Economy does not mean laying up your car or doing without a car. Use your car. Spend money on it. Help keep the motor industries busy by spending. But spend judiciously. Spending is not wasting if you use your car wisely. Using it unwisely and with no regard for economy is wasteful.

The practice of sane economy without yielding a single bit of business or pleasure is easy. It is not necessary to discharge your chauffeur or helper. Use judgment and common sense and get full value for your money. Spend your dollars on your motor, but make them yield values. I am trying this and I will tell you how I am succeeding by sane methods. You can and should do as much.



Gasoline feed system of the car of to-day

Practise Economy in Driving

Reduce gasoline consumption.

Lubricate thoroughly.

Secure efficient ignition.

Keep the engine and all parts finely adjusted.

Watch your tires; protect them; make their lives long.

Reducing gasoline consumption is not play, but it is easy. You simply have to watch your motor like a hawk, check up your mileage frequently and keep all adjustments perfect. The biggest waste on your list will be from an idling motor. Keep your mind on this and do not allow your motor to run when you stop your car. And when you start it in the morning, let it run slowly until heated. Do not speed it up in order to heat it quickly. Take four or five minutes, if necessary, and you will save gasoline as well as your engine.

The next greatest waste of gasoline is due to leaking carburetors. This is absolutely due to negligence. Keep your carburetor clean and cut out leakage. Trouble in this respect is usually due to improper valve seating. Dirt accumulates under the float valve.

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The flooding of this valve is easily stopped by depressing the float and twisting the needle valve around as the gas goes into the float chamber. If the flooding is due to imperfect seating of the float valve, it may be ground on its seat by using a little whiting or by holding the valve and seat in their true positions and rotating with a fair sort of pressure.

When you have all leakage stopped, be sure to adjust your carburetor so that you will get the maximum explosion with the least possible gas. Experience alone will demonstrate the best adjustment. Start in with an extremely lean mixture and gradually change until you have secured what you consider a satisfactory adjustment. Keep careful track of your consumption and gradually make your mixture a bit more lean, if you can do so without suffering from lack of power. Vary your mixture according to conditions. If the mixture is too rich, it will cause overheating. If too lean, a weak action follows but no overheating. With a proper and good mixture you may advance or retard your spark without ill effects

Practise Economy in Driving

You must have correct timing. The spark must be fired at exactly the proper time to get the fullest explosion; otherwise you will waste a quantity of gas. You must have your ignition so perfect that you will get the maximum efficiency. Pay strictest attention to your wiring, your battery, spark plugs and all other units of your ignition system. Have your plugs absolutely clean and all other parts of your system accurate and full of pep. Have your valves accurately seated and examine them frequently. A leaking valve causes loss of power, which brings an excessive use of gas, since a larger quantity is required to overcome this loss of power.

By all means keep your car free from carbon. The loss of power through carbon causes the excessive use of thousands of gallons of gas annually through requiring extra fuel. The interior of the engine must be perfect to get the greatest results. Piston rings must be properly fitted so that they may perform their proper functions and thereby prevent fuel being wasted by slipping past the rings into the reservoir. If your rings are

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not tight, try fitting leak-proof rings. But be sure to see that they are so fitted that no leak takes place. Leaky rings are an abomination which piles up the cost of motoring to an extent few persons even faintly realize, for they not only call for more gas but oil as well.

Kerosene is being used more than in the past. Some makers of kerosene carburetors or devices will sell them on trial. Where you can get a device which will permit the use of a mixed fuel of gas and kerosene, I would advise a trial. In some instances three parts gas into one part kerosene have been used with only carburetor adjustments, but I am not familiar with such practices. I use distillate when in Southern California with good results, but I do not advise it elsewhere. There are a number of helpful articles on the market for decreasing gasoline consumption.

When you have solved the gasoline adjustment problem and cleaned your engine thoroughly, reduce all friction in your car to a minimum. This is accomplished by proper lubrication. With every car is a lubrication chart formulated by the manufacturer.

Practise Economy in Driving

Study this and follow it as closely as possible. Friction means extra power, which means more fuel. Lubrication must be abundant, correct and complete to the final detail in order to save all possible power. Have your clutch properly adjusted and keep it in perfect condition with proper lubricants. A slipping clutch means many dollars of gas expenditure.

Be careful of your tires. Give them proper care and make them last as long as the tire manufacturer made them to live.

The National Automobile Chamber of Commerce has made these suggestions for economy in gasoline and I pass them on to you:

Do not use gasoline for washing or cleaning—use kerosene to cut the grease.

Do not spill gasoline or let it drip when filling—it is dangerous and wasteful.

Do not expose gasoline to air—it evaporates rapidly and is dangerous.

Do not allow the engine to run when the car is standing. Cars are fitted with selfstarters and it is good for the battery to be used frequently.

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Have carburetors adjusted to the leanest mixture possible—a lean mixture avoids carbon deposits.

See that the piston rings fit tightly and that the cylinders hold compression well. Leakage of compression causes loss.

Stop all gasoline leakage. Form the habit of shutting off the gasoline at the tank or feed pipe.

See that all bearings run freely and are well lubricated—friction consumes power and wastes gas.

Protect the radiator in cold weather—a cold engine is hard to start and is short in power.

Keep the tires fully inflated—soft tires consume power.

Do not drive at excessive speed. Power consumption increases at a faster rate than speed. Every car has a definite speed at which it operates with a maximum fuel economy.

Change gears rather than climb hills with wide open throttle—it saves car and gas.

Do not use cars needlessly or aimlessly. By the exercise of forethought a number of

Practise Economy in Driving

errands can be combined so that one trip to town or elsewhere will do as well as two.

Reduce the amount of riding for mere pleasure by shortening such trips or cutting down their frequency.

CHAPTER VII

HELPING TO KEEP YOUR CAR NEW

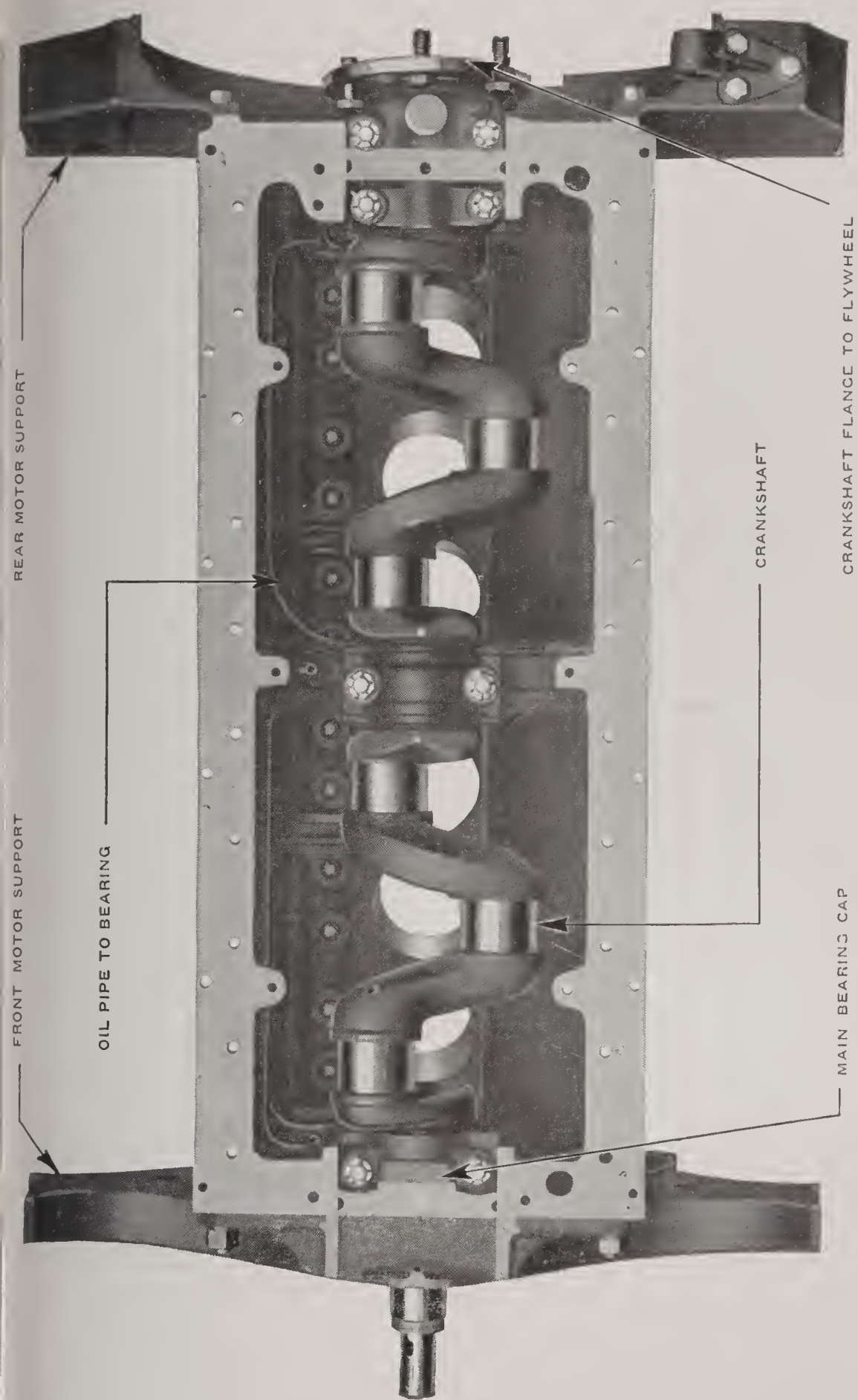
DURING my many years of racing and touring I have seen so many cars ruined long before their time for usefulness should have passed that I want to offer a few suggestions to the new owner and the man who expects to get "full value" out of his purchase. For it is a fact that more cars are put in bad shape the first three months of work than are damaged by six months of use at any other stage of ownership.

Don't speed your new car under any circumstances.

Don't be afraid to lift the hood and learn something of the motor mechanism.

Don't be careless regarding your oils and greases.

Don't hesitate to have your service expert re-adjust your carburetor every five hundred miles until you have gone two thousand.



A typical crankshaft and bearings layout

Helping to Keep Your Car New

Don't fail to watch for loosening bolts and nuts in all parts of the car.

Don't neglect to watch your tires and keep them at proper pressure.

Don't expect merely to pour in gas, oil and water; and yet retain a perfectly running automobile. Give a little care and study to it.

Don't let your car get dirty and stay so. Treat it as you do your person.

Don't allow dirt and greases to cake around your engine, starter, transmission or in your dust pan.

Don't abuse your car by purposely climbing the highest hills and speeding over the roughest roads. I know cars two and three years old which look new inside and out—and run perfectly—because the owners handled them with care and saneness.

The new owner is prone to drive his car too fast. This is positively deadly if you want long life for your machine. Better keep around fifteen to twenty miles an hour the first five hundred miles and give your car a chance. This permits all the parts to get

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worked in smoothly and the engine to lose much of its stiffness. I'll admit it is hard not to "just let her out" a few times, but keep a cool head and go slow. After five hundred miles you may go as fast as thirty miles an hour, and then after 1000 miles push her up another five until you have been 1500 miles. Then she should be good for any speed you wish and she should not be easily damaged.

Many owners are afraid to raise their hoods, saying that they know nothing of mechanism. Better learn something; or else you may have to do a lot of walking at the most inconvenient times. Study the instruction book which comes with all cars: it is plain. It is simple. It is full of illustrations on every part of your car. Trace these out. Learn to know everything possible about your engine without tearing it down. Learn the whys and wherefores from this book. If necessary, have your service man go over the engine with you. All this for emergencies, if nothing else. You will quickly learn to appreciate your car all the more.

In the matter of oils and greases, be sure

Helping to Keep Your Car New

the car is thoroughly right before you drive away. Sometimes the best inspectors rush and allow defects to get by and fail in some point. Follow your instruction book. When you have gone five hundred miles drain off all oil and gas. Clean the receptacles and re-fill with fresh supplies. This is especially important as regards oil. Keep all grease cups filled and well turned up. Look them over and turn them up every two days and, in cases of hard driving, every day.

As your car settles to its work and gets running more and more smoothly have your service man change the adjustments on your carburetor to meet new conditions. It will save gas and increase power. Have him examine the valves at the same time and see that their adjustment is perfect. An important matter is putting water in the battery at least every two weeks. Test the battery with a hydrometer every ten days. Use only filtered or pure rain water.

While a car is new, the owner should go over it carefully every ten days or so to tighten up loose bolts, nuts or parts. This

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takes little time and may mean a tremendous saving. Body bolts and spring clips should especially be watched until the car has thoroughly worked to its normal positions. Be careful in the use of your clutch. When you examine your car, look this over very particularly. New clutches are stiff and need to be handled gently. Handle your gears gently, until they work smoothly. Keep your brakes well-adjusted.

Tires should be kept at a standard pressure of twenty pounds to the inch—that is eighty pounds for a tire 34 x 4, etc. Frequently a slow leak develops in valves and, before one knows it, a tire is ten to twenty pounds under pressure. Watch this closely and save big money. If you use cord tires the pressure should be fifteen pounds rather than twenty.

Of course, you will want the outside of your car to look well. Take my advice and keep the inside clean, too. It's just as important to have a clean engine, starter and general mechanical parts as it is to keep the body bright—more important to your pocketbook. With gas so scarce, use kerosene in cleaning

Helping to Keep Your Car New

the engine and mechanism. Dirt plays havoc when allowed to collect in quantity. Even a little dust sometimes causes a lot of trouble by working into important parts.

Be very careful in washing your car. When it is new, the lustrous enamel of the varnish needs strict attention. Use cold water from a gentle stream or poured on. Use a large sponge for mud spots and soak them off. Don't rub, or scratches will mar the whole finish. Use a good polish now and then, sticking to instructions which come with the preparation you buy.

In winter protect your radiator with a cover and use an anti-freeze mixture in the water. Drain the radiator every thousand miles and thoroughly cleanse with clean water under strong pressure.

CHAPTER VIII

HOW TO WASH YOUR CAR

WHEN a car comes in from a run, wash it, if possible, before the mud has a chance to dry and harden. If you cannot wash it then, it is better to rinse it off, and let it stand in that condition, than to allow the mud to bake on. A car is usually hot when it comes in, and the mud will dry up quickly and bake very hard, and, wherever the mud does bake on, it hurts the surface of the paint.

Never dust off a finished surface dry. Don't use a feather duster, or any kind of a duster, to remove dust from a car. Have it washed.

In washing a highly finished painted surface, never rub the surface with a sponge, cloth or chamois, or anything else, until the mud and grit have been thoroughly rinsed off. The car should first be gone over with the

How to Wash Your Car

open end of the hose, with the water running partially turned off. That is, use a big stream, but little pressure. Always begin at the top and work downward. By the time the entire car is gone over, unless it is an unusual case, the dirt should be loosened up sufficiently to rinse off by going over the car again. In case of very stubborn mud, take a soft sponge, and keep it thoroughly saturated and just touch the surface to be cleaned. Under no circumstances rub it.

If, after getting all the dirt and grit off, you find greasy places on the panels, use an old chamois and Ivory soap, rinsing the chamois often. Never wipe the body panels with a chamois or sponge which has been used on the running gear, as it is almost certain to hold grease, which will spot the highly finished surface. After the grit and grease have been thoroughly removed, rinse the entire car thoroughly to insure that every bit of soap is removed. After this, wet a good clean chamois and wring dry, and go carefully over all painted surfaces, wiping them dry. This will remove practically all the water, but the car

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should be kept in the shade until it is thoroughly dried.

If you will follow the foregoing rules, your car will look just about as well at the end of months of usage as when new. But, just as sure as you use harsh washing soaps or soft soap, and do not wash your car properly, it will be a matter of only a few weeks before the best finished car on earth will look old.

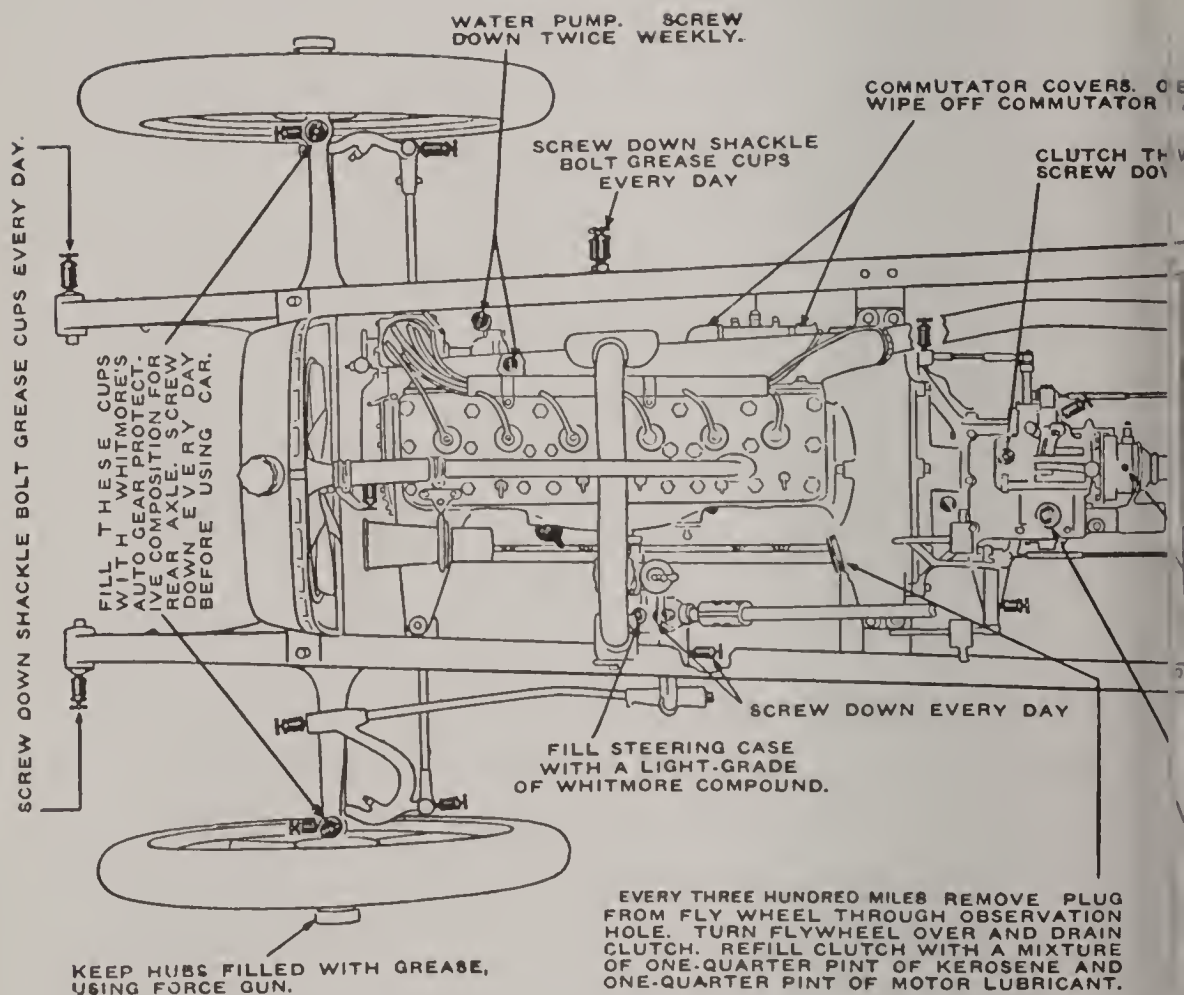
CHAPTER IX

LUBRICATION MOST IMPORTANT

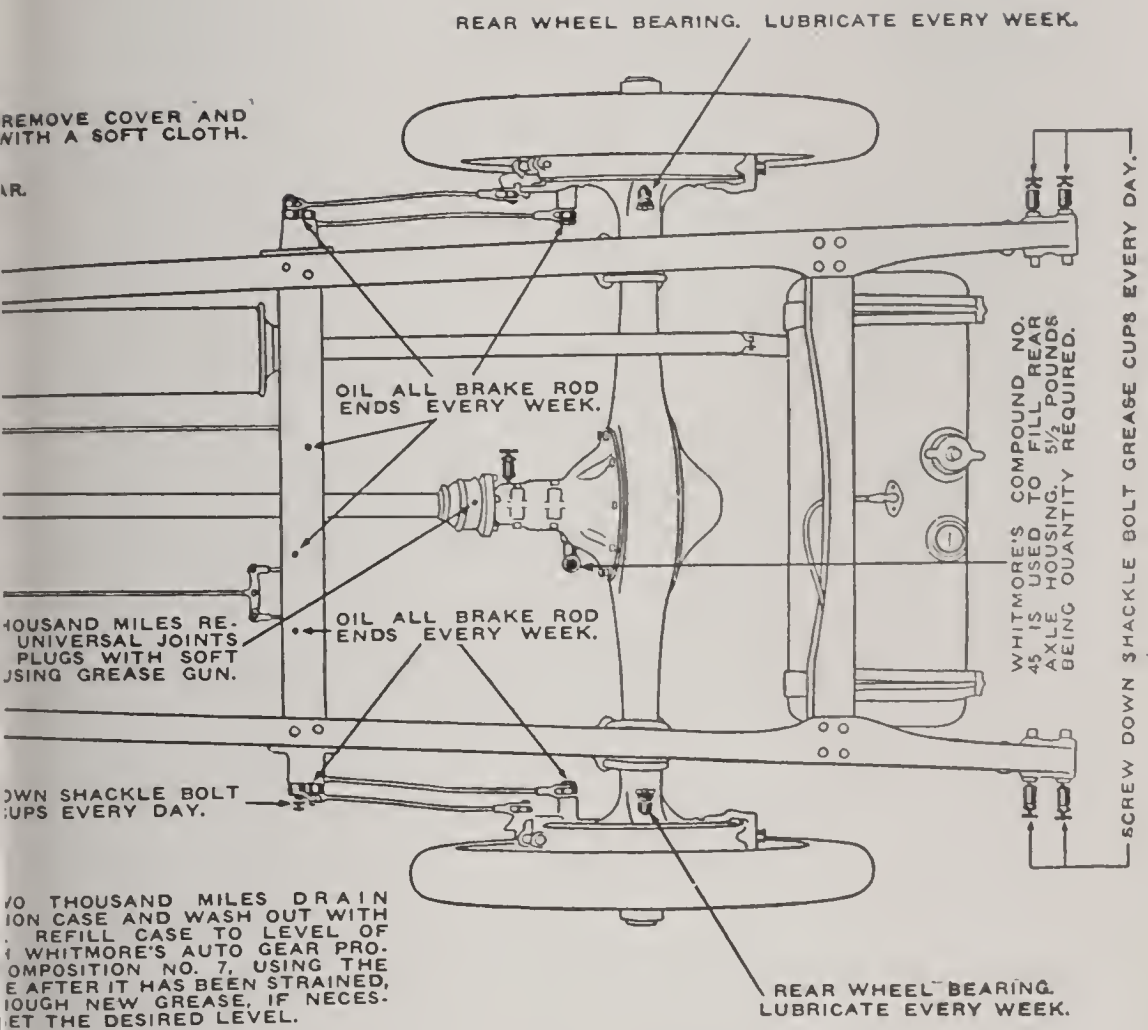
WITHOUT any doubt whatever, the most important thing incidental to the operation of a motor car is lubrication. By this I do not mean the engine alone, but all the parts of the car. Without good lubrication satisfactory driving is an impossibility.

I have seen hundreds of motorists rolling along a highway with their cars groaning for oil. The owners paid, and paid big, for their neglect and probably blamed the manufacturer for the car's failure to live as long as they thought it should.

To say nothing of the absolute misery of riding in a car which creaks and screeches, owners are simply throwing away thousands of dollars in neglecting the lubrication of their cars. If they are unaffected by noises, they should consider their pocketbooks.



Lubrication chart of typical six-cylinder chassis. It illustrates the m



which need attention on all cars. The instructions are complete

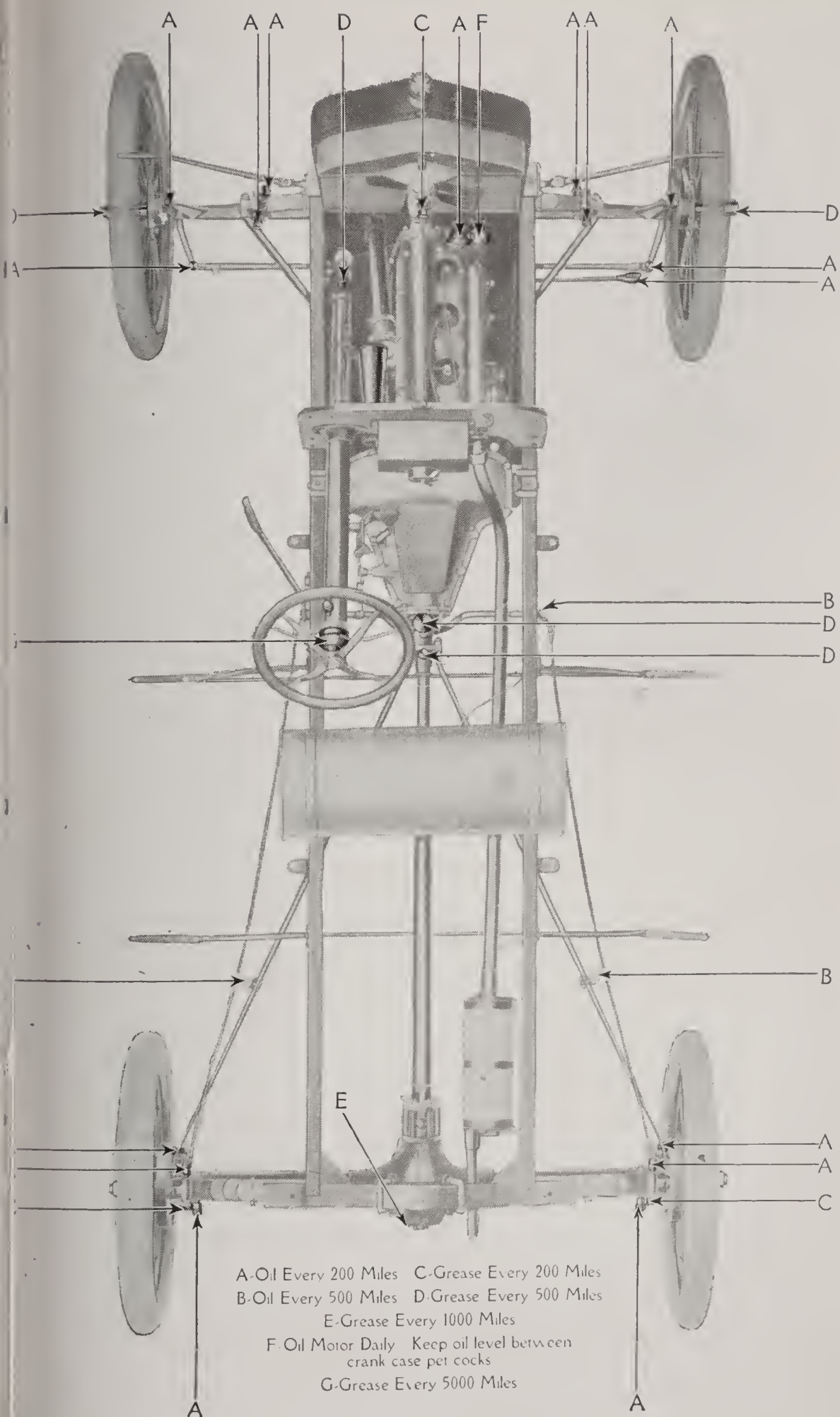
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Most often it is the man who cannot afford the loss of money who neglects his car, too.

In the first place, every manufacturer places in every car made a book of instructions regarding the operation, care, upkeep and lubrication of that particular car. No owner should operate his machine without giving careful study to this book. He ought to give more than careful study to that part dealing with lubrication. He should practically memorize it and he should read it again every now and then to re-charge his interest in the subject.

Having learned what the manufacturer has to say about lubrication he should study the reports of experts employed by oil companies and apply what their experiments show to be valuable to him. After this an owner should make up his mind to buy the best of lubricants—always.

Manufacturers make a world of experiments with various lubricants in their test work and cross-country driving. Each recommends what is best for his particular car and the owner should follow this recommendation.



Lubrication chart of a Ford

Lubrication Most Important

The service man of the manufacturing company usually goes the full length in his recommendations and suggests what is best for each particular part of the car. He has spent a world of money in making these experiments and the owner who does not benefit therefrom is taking uncalled for chances. I can only add this suggestion:

Buy your oils in small quantities in original packages.

Manufacturers sell oils in casks and dealers distribute them in any quantity from one pint up. But manufacturers also put up their products in gallon and half gallon,—even in quart, cans—with their own seals. This is always preferable. You take no chances when you buy products in this way, whereas you do take chances when you buy from a dealer by driving up with this request:

“Give me a quart or a half gallon of oil.”

Possibly you may say medium, or heavy, or light, as the case may be; but you should know just exactly what grade of oil you want and you should buy that and no other. I have seen many owners ask for a special grade

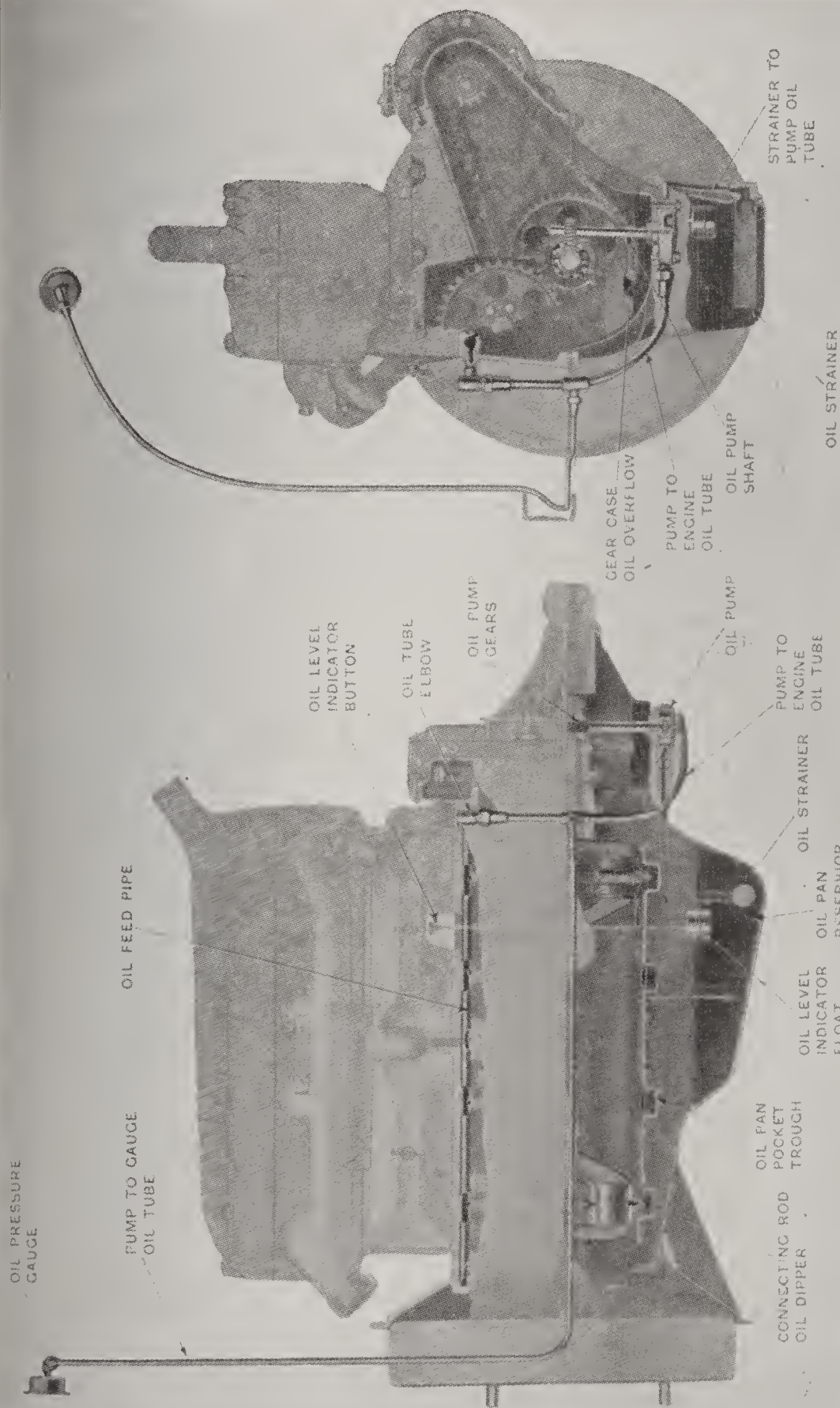
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which the dealer did not have and yet accept whatever he did have because of pressing need or carelessness. There should never be an occasion for "pressing need," if the owner gives proper care to his car; hence, he should always be in position to buy that product which experience proves best needed by his car.

I have a young friend who bought fifty gallons of oil shortly after the purchase of his first car. He bought a cheap oil because the salesman showed him how much money he would save. That young fellow learned his lesson. This cheap oil was not only what he should not have used, but it proved the most costly oil he ever had because of its inefficiency. It also caused wearing of his car, which likewise added to the burden of operation.

I honestly do not believe that one owner out of a hundred gives proper attention to lubrication. All admit its importance, but neglect it in an alarming manner.

There is one thing I want to say and that is:



Four-cylinder engine lubrication system

Lubrication Most Important

DRAIN YOUR CRANKCASE REGULARLY EVERY 500 TO 1000 MILES.

It is generally conceded that fair results are to be had from draining the crankcase, washing it out and re-filling every 1000 to 1500 miles; but to get the maximum of good service it is far better to spend an extra dollar or so for oil and clean out the motor thoroughly every six hundred miles. I have known many owners who failed to drain their crankcases and fill with fresh oil even after 2000 to 3000 miles. That is criminal. Not only drain out the oil but pour kerosene into the crankcase, run the motor about a minute and clean out the system thoroughly. This will get maximum service from the motor.

Remember also that a different grade of oil should be used in winter from that used in summer. Usually a thin oil is required for winter because of the tendency to congeal at low temperatures. In summer a thin oil is not effective because the heat takes the life out of it by thinning it out past the point of usefulness.

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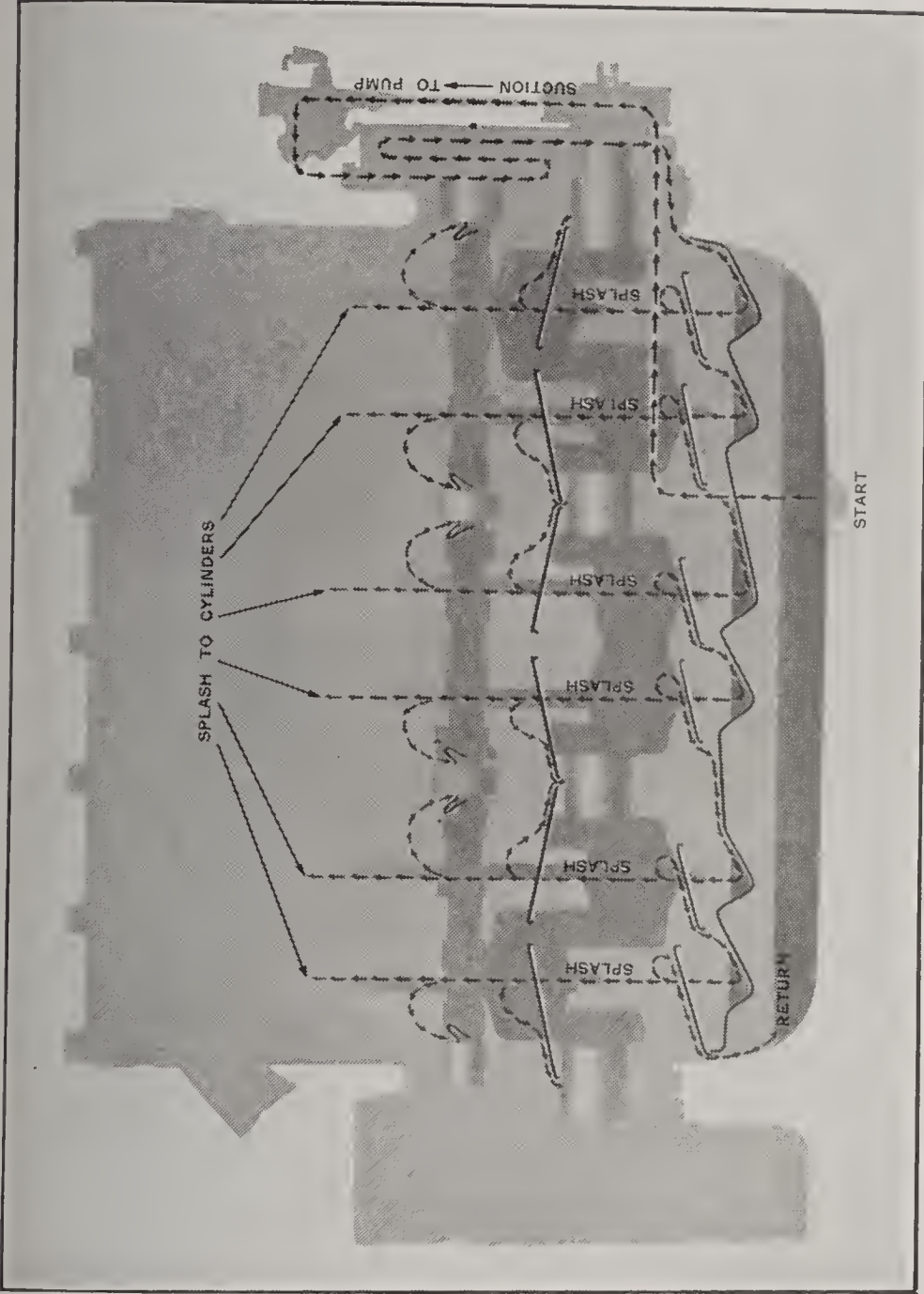
I am not going to attempt to give owners full instructions as to oiling the various parts of their cars. Every service station has lubrication charts for their particular cars, while every instruction book features lubrication, too. I can only say that the motorist who neglects to study and follow the directions is piling up trouble for himself. I do want to make a few suggestions for comfort in motoring:

Keep your grease cups full of grease and turn them up daily. Get at all cups, even those not in plain sight.

Keep your springs in condition with oil and an occasional prying apart and filling with graphite mixed with oil.

Keep your steering wheel and connections well-oiled to insure easy driving and quick response. A drop of oil daily in the steering wheel oil hole will help. Pack the gear case every three hundred miles.

Your electrical system should be kept thoroughly lubricated, and this includes the starter. It is just as important to oil as to keep clean.



Action of oil in a pump and splash system. This shows the crankshaft and bearings

Lubrication Most Important

In general, though, follow your instructions on lubrication. It takes a little time almost every day; but it re-pays in comfort, in long life for the car and in pride of operation and ownership.

LUBRICATION TABLE

The following table may be accepted as generally accurate in its recommendations for lubrication attentions to the various parts of the mechanism, though there will be variation in regard to certain cars and models.

Daily Lubrication

Clutch collar and thrust bearing: Grease or graphite.

Spring bolts: Grease or graphite.

Drag-link joints or steering gear: Grease or graphite.

Tie rod and king bolts: Cylinder oil.

Lubrication Every 300 Miles

Steering gear case: Grease or graphite.

Brake levers and clevises: Cylinder oil.

Commutator: Cylinder oil (few drops).

Steering post: Cylinder oil.

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Brake shafts and pedal bearings: Cylinder oil.

Lubrication Every 500 Miles

Spring leaves: Graphite or heavy oil.

Crankcase: Cylinder oil, drain, flush out and re-fill.

Magneto-distributor: Drop of cylinder oil in holes.

Gear case: Oil, light in winter and heavier in summer.

Lubrication Every 1000 Miles

Wheel bearings: Grease or graphite after thorough cleaning.

Universals: Grease or graphite.

Torsion tube, radius rods and similar parts: Grease or graphite.

Gear case: Drain, flush with kerosene and re-fill with oil, light for winter, heavier for summer.

CHAPTER X

NOISES AND HOW TO CURE THEM

OF course every car owner likes to drive a quiet machine. He cannot hope to have an absolutely silent vehicle, but by taking due care, in due course he can produce a condition of relative quiet, which will be gratifying.

The engine is the place where noises are most frequently found and the commonest of engine noises are those made by the valves, clicks and slaps. These valve noises may be easily located from the fact that they occur with the utmost regularity. If there is too great a distance between the valve stem and the tappet, a click will result. Also, an excessive clearance between the lifter and the push rod may cause a very unpleasant noise.

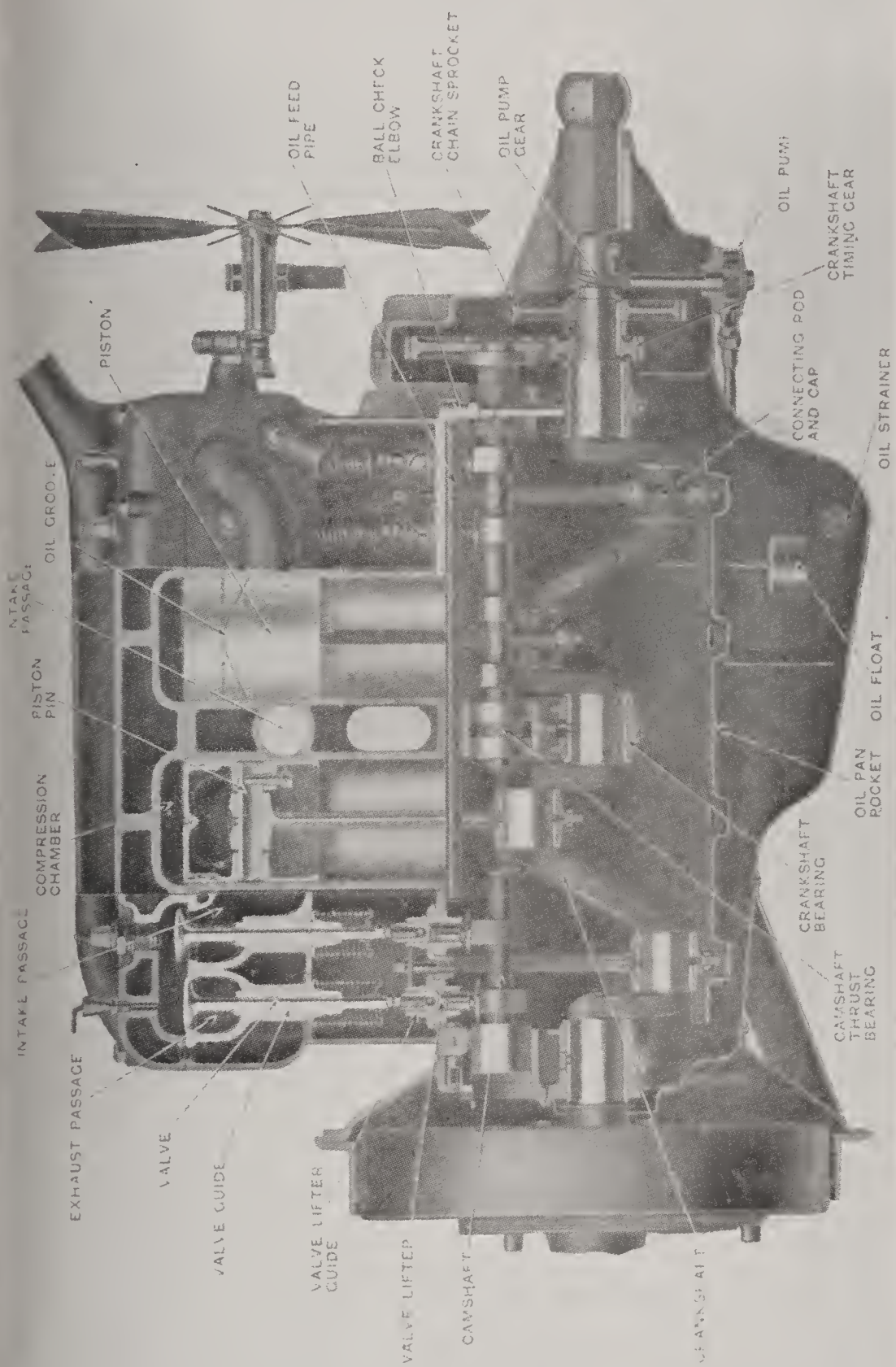
In this case, it is easy to cure the noise by reducing the clearance between the offending parts. In making adjustments to the valve

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system, do the work while the parts are still hot after the run. You see the valve system ordinarily runs hot and so adjustments, made when the metal is cold, may not be correct after it gets hot and expands.

Sometimes slaps result from the lifter being loose on the guide and, in this case, the part must be replaced. Also, too much clearance may develop between the cam and its follower. By putting in new followers, this trouble can be remedied. Worn valve stems or guides will produce a clicking. By taking out the valve springs it is easy to locate trouble here. If there is play of the stem in the guide, it will be necessary to fit a bushing or else put in valves with oversize stems.

The valve system that is located overhead, as a general rule, is noisier than the ordinary type. For this type of system attention must be paid to lubrication. Even so side-play occasionally develops in the rocker arm and the result is a click. If the bearing of the arm is worn, it will be heard from, and the only cure is to put an oversize bushing on the rocker arm.



Section of a four-cylinder engine

Noises and How to Cure Them

Another source of troublesome noise is the engine bearings. These are made of soft metal and, if the lubrication fails for a moment, these parts will be burned more or less and, if they are not destroyed, they will be flattened somewhat and a decided knock will result. This means a job of taking up the bearings, which is done by removing a shim from between the two halves of the bearings, or else by trimming off some of the metal. In taking up bearings, the utmost care must be used to see that the bearing touches the shaft all around without binding it anywhere. When bearings are being fitted, one of the chief difficulties is to get the shaft correctly aligned. If the shaft is out of line, the gears in the transmission are certain to bind and growling will start in this part.

Sometimes the flanges of the crankshaft bearings develop noise, through being flattened by the thrust of the shaft. The only thing to do in this case is to fit new bearings. So, too, play may develop in the upper rod bearing. Sometimes the owner thinks that the seat of this latter trouble is the lower rod of

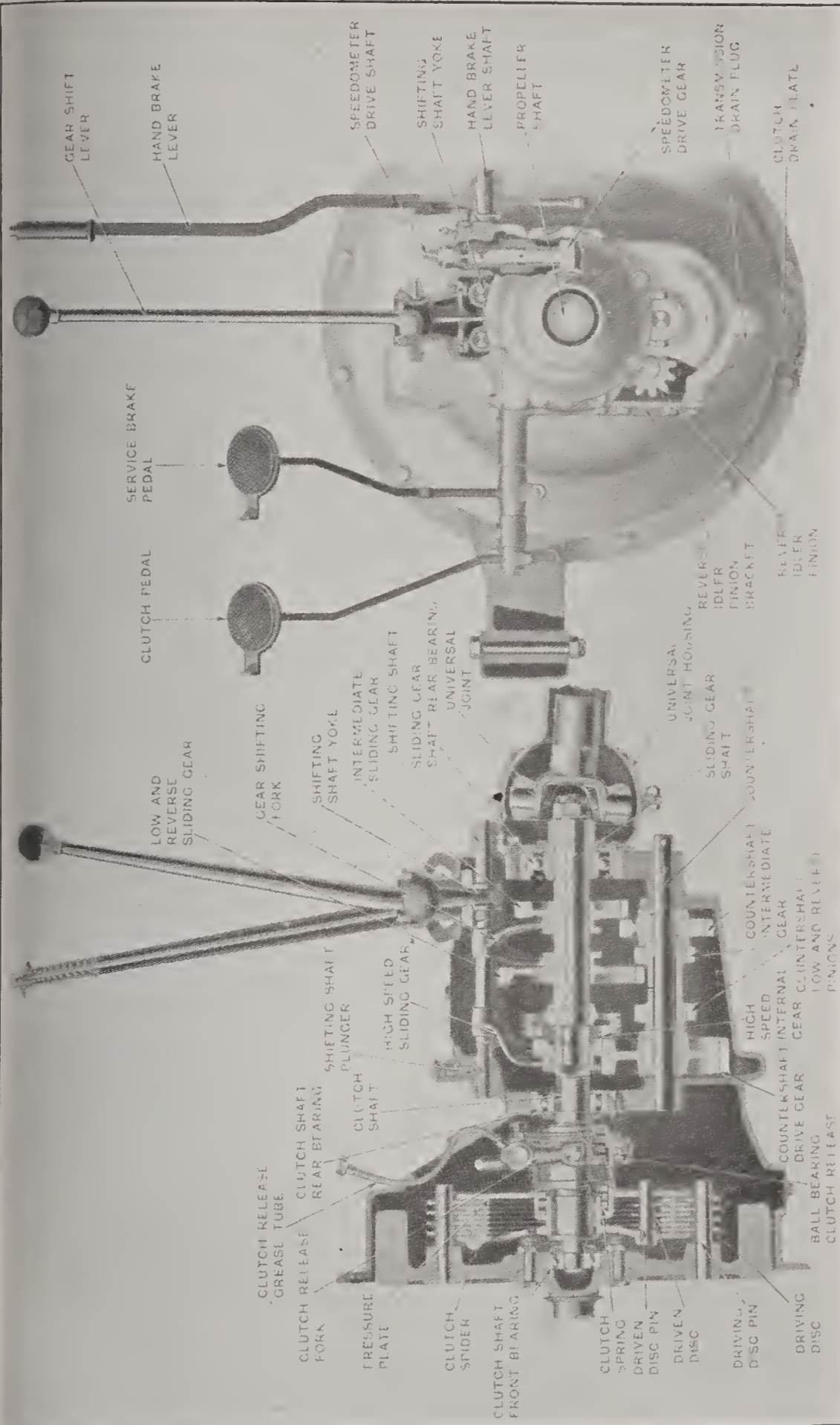
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crankshaft bearing. Some cars do not have the bushing at the top of the rod, but most modern cars have a bronze bushing to take up wear. In cases where there is no bushing, it is necessary to fit a new piston pin.

When a piston or cylinder becomes worn, a noise will develop which sounds like the knock that is caused by pre-ignition. In some mild cases, it is possible to cure this trouble by fitting new piston rings. If the trouble is severe, it may be necessary to fit a new set of pistons. In cases where the cylinder has been worn out of round, this part will have to be re-bored and a set of oversize pistons must be fitted.

Noises in the timing gears and timing chains are a tough proposition to handle. Many silent chains have an adjustment feature which enables the car owner to take up slack, but others have not and in this instance it becomes necessary to replace worn links with new links to get rid of the slack.

One of the most frequent noises is that which comes from pre-ignition. A number of things may cause this knock; among them the



Clutch and transmission

Noises and How to Cure Them

simple practice of driving with the spark too far advanced. Carbon in the cylinders will cause pre-ignition, so will bad timing, overheating, overloading of the engine and a poorly proportioned fuel mixture. The meaning of pre-ignition is simply that the charge of fuel is exploded before the piston has reached top center. Thus the piston receives a thrust which drives it against the cylinder wall and the result is a loud metallic knock.

When a knock of this kind develops in the engine, the best way to tackle it is to start at the beginning and by a process of elimination find out what cause is behind it. First, determine whether the cylinders contain undue deposits of carbon. This is the most common cause. Next, try the spark control and see whether you have been using it too far advanced. Next, experiment with the fuel mixture and so on.

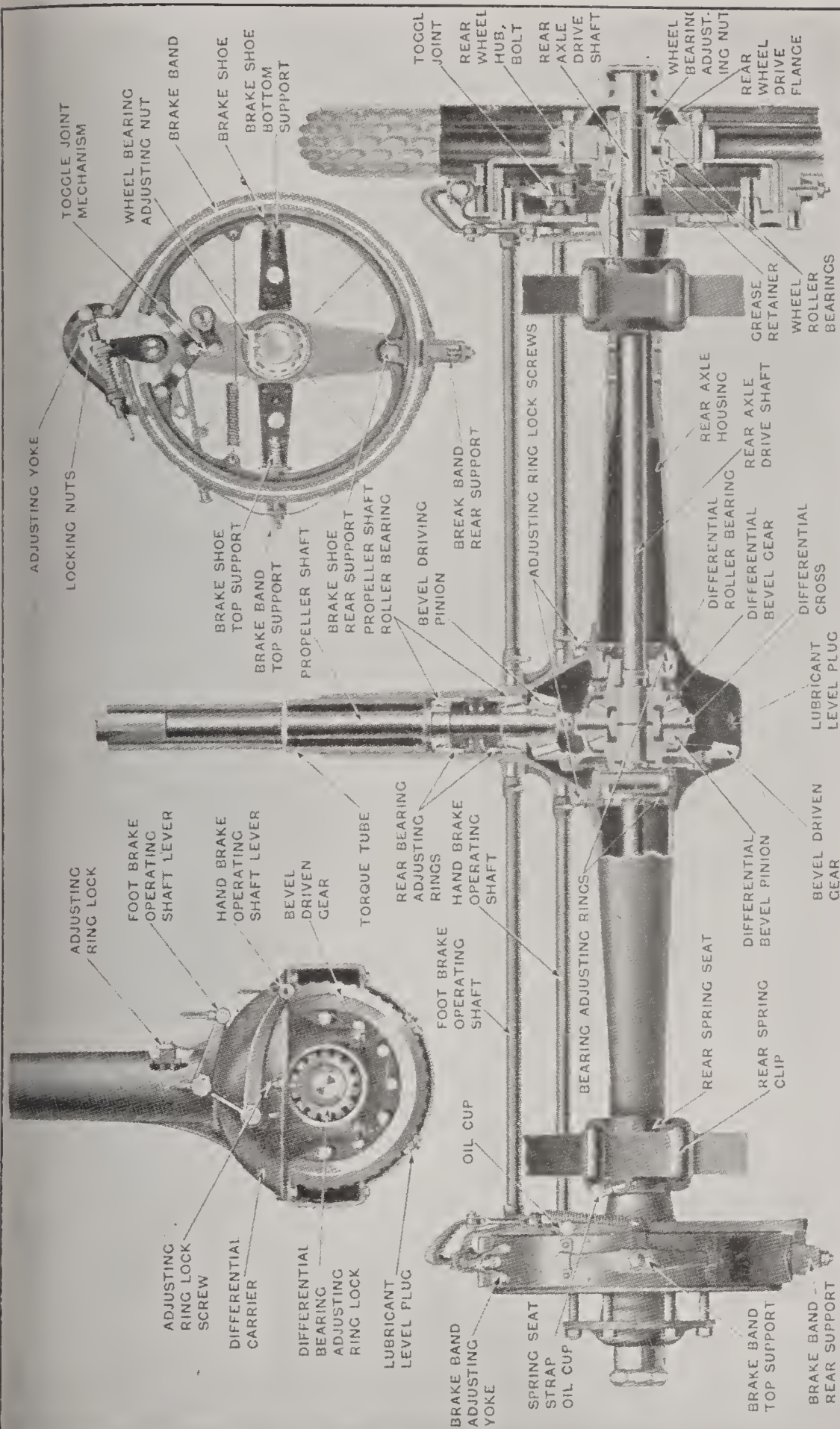
Noises in the transmission are encountered frequently and are most annoying. This condition may mean that the shafts, or one of them, are out of alignment, through wear in a

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bearing or binding in a gear. Sometimes the entire transmission case will get sprung out of true, so that both shafts are out of correct alignment. Habitual trouble in the transmission may be taken as a sign that the whole unit is out of alignment and the car owner had better call upon the service station.

The rear axle often develops noises in operation. This may mean that the driving pinion and differential master gear are out of alignment, which produces a furious humming sound. In most cases it is possible to adjust out-of-alignment in the rear axle by shifting the whole differential unit, but this is not a job that the ordinary amateur can tackle.

In addition to the mechanical noises that I have enumerated, there are numerous annoying squeaks that develop from time to time. The springs and their shackles must be kept properly lubricated or they will squeak. The body is subject to shrill noises and the only remedy is to keep all bolts and nuts drawn up tight. Door rattles may be stopped by little wedges of rubber, and felt can be used to keep the fenders noiseless.



A rear axle

Noises and How to Cure Them

It may be accepted that noises about the automobile are not a sign of health, so that it is not only a matter of convenience, but an actual necessity, to keep hunting them down and remedying them, if the car is to be kept in the best possible order.

SUMMARY OF ENGINE TROUBLES AND THEIR CAUSES

Engine Fails to Start

1. Gas mixture too lean.
2. Water in gasoline.
3. Vibrators adjusted too close.
4. Water or congealed oil in commutator.
5. Magneto contact point (in trans. cover) obstructed with foreign matter.
6. Gasoline supply shut off.
7. Carburetor frozen (in zero weather).
8. Water frozen in gasoline tank sediment bulb.
9. Coil switch off.

Engine Lacks Power—Runs Irregularly At Low Speeds

1. Poor compression—account leaky valves.

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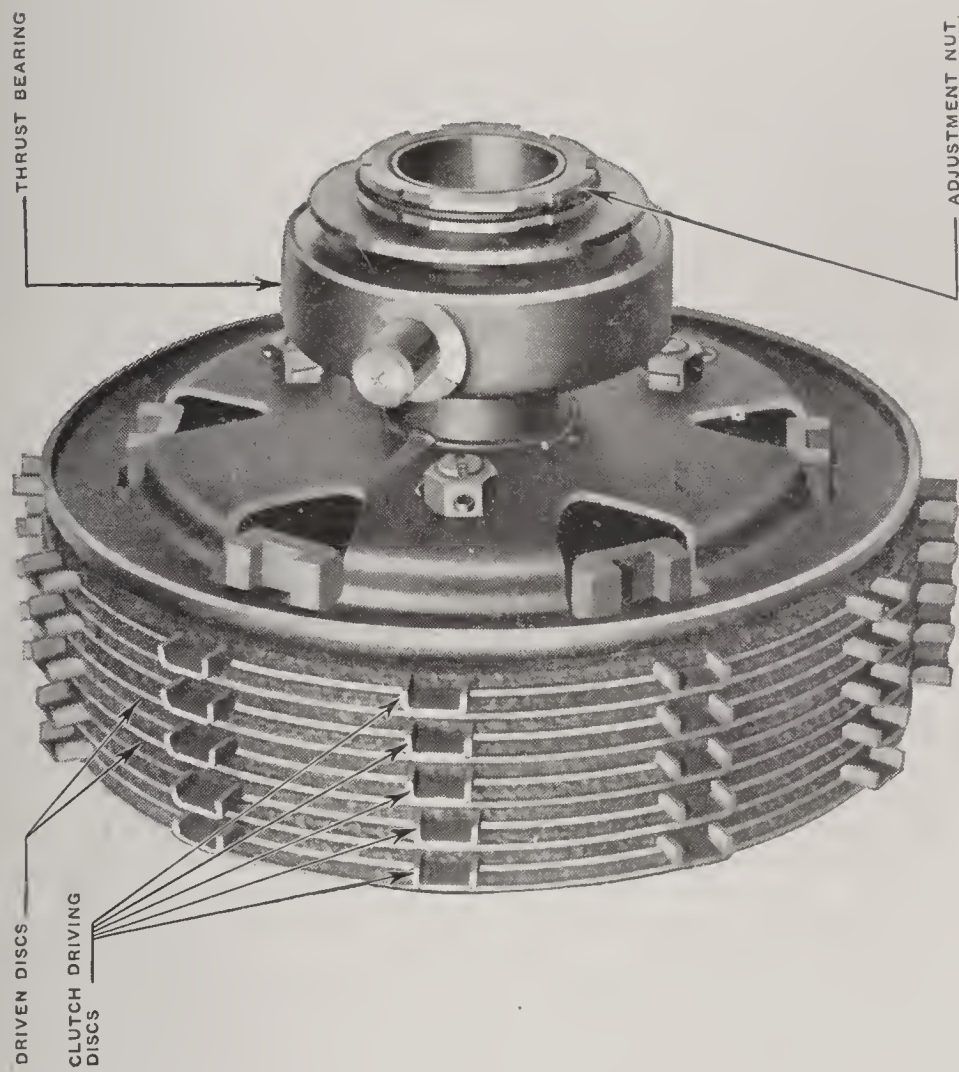
2. Gas mixture too rich or too lean.
3. Spark plugs dirty.
4. Coil vibrator improperly adjusted.
5. Air leak in intake manifold.
6. Weak exhaust valve spring.
7. Too great clearance between valve stem and push rod.
8. Too close gap between spark plug points.

At High Speeds

1. Commutator contact imperfect.
2. Weak valve spring.
3. Too much gap in spark plug.
4. Imperfect gas mixture.
5. Vibrator points dirty or burned.

Engine Stops Suddenly

1. Gasoline tank empty.
2. Water in gasoline.
3. Flooded carburetor.
4. Dirt in carburetor or feed pipe.
5. Magneto wire loose at either terminal.
6. Magneto contact point obstructed.
7. Overheated—account lack of oil or water.
8. Gas mixture too lean.



Clutch of the dry-plate disc type showing adjustment nut with ball thrust bearings

Noises and How to Cure Them

Engine Overheats

1. Lack of water.
2. Lack of oil.
3. Fan belt torn, loose or slipping.
4. Carbon deposit in combustion chamber.
5. Spark retarded too far.
6. Gas mixture too rich.
7. Water circulation retarded by sediment in radiator.
8. Dirty spark plugs.

Engine Knocks

1. Carbon deposit on piston heads.
2. Loose connecting rod bearing.
3. Loose crank shaft bearing.
4. Spark advanced too far.
5. Engine overheated.

CHAPTER XI

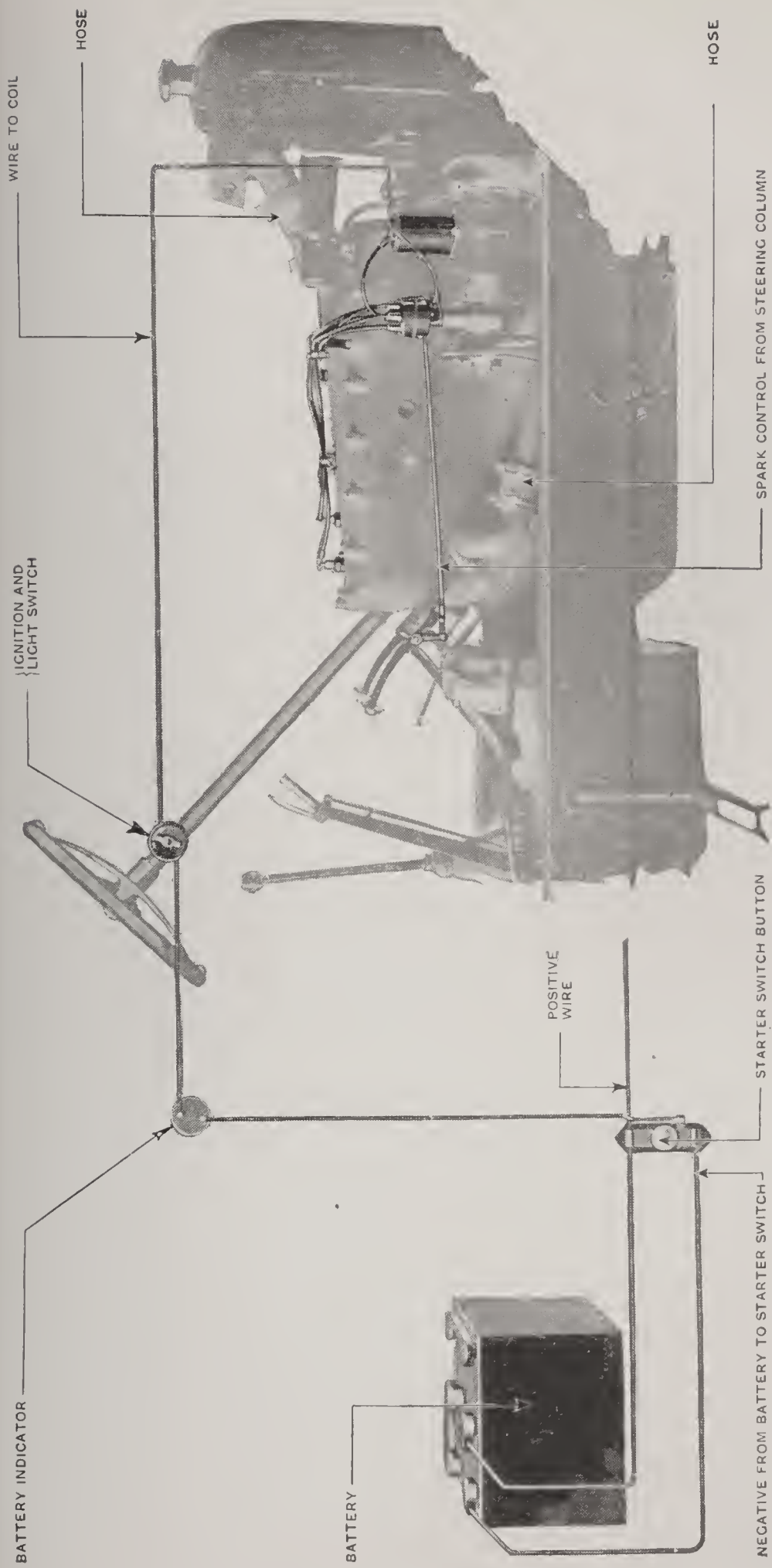
CARING FOR YOUR STORAGE BATTERY

STUDY your storage battery—not just superficially, but seriously—and save many dollars.

Lack of knowledge of batteries costs hundreds of thousands of dollars each year. This is money absolutely thrown away.

Let's get busy, all of us motorists. Let's learn something about our batteries, their construction and care. Let's save a lot of money which we are now wasting. I'll do my share by a discussion of the make-up and care of this important part of the car. You lend your aid by taking advantage of any good hint my experience may make it possible for me to suggest.

It has been freely stated by the closest observers that the average life of a battery is only fifteen months. This is far too short. It should be from a third to two-thirds more.



Modern battery layout and ignition system connections

Caring for Your Storage Battery

In many instances batteries have lived as long as the best of cars. They had care of the kind which would prove intensely valuable if followed by all motorists. There really should be little limit to the length of service given by a good battery properly looked after.

Giving the battery proper treatment does not require technical knowledge or skill. It

almost take care of itself. But there are few absolute duties owners must perform. They are simple—so easy, in fact, that this becomes the very reason for such waste and neglect. There are but two vitally important services required by the battery. They are:

Feed the battery plenty of distilled water.

Keep the terminals clean and bright—grease them occasionally.

Of secondary importance is a careful watch for short circuits. A battery can be almost ruined and mighty quickly by a tiny short circuit. So look over your wiring every now and then for this trouble. At the first sign remedy the wiring, quick!

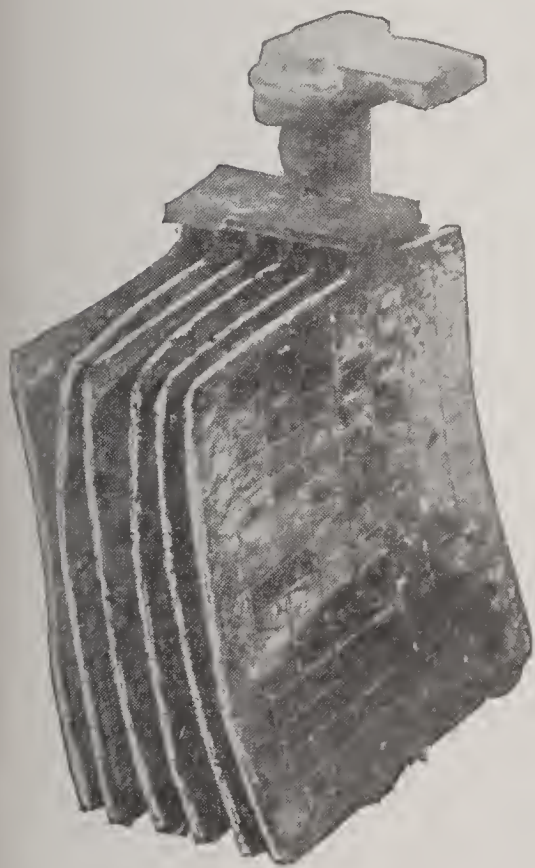
Manufacturers of batteries are doing a mighty work in educating owners as to battery

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performances and care. Service stations are maintained the country over. Here distilled water is provided free and in most instances a regular inspection is made, also without charge. Any owner of a battery may receive a free inspection card at these stations. It would seem that this educational work would kill repair business. But far from it—service station employees are kept on the jump.

Every car owner should have a hydrometer—an instrument for testing his battery. He should make tests at least once every week or, at the most, every ten days. The hydrometer tests the specific gravity of the battery fluid, which should always stand as close to 1.30 F. as possible. If the reading is 1.15, or less, the battery is discharged. At 1.27 to 1.30 it has a full charge.

Why all this talk of distilled water? the new motorist or the uninitiated may ask. This is best answered by an explanation of the storage battery. There are several types of the latter but that most widely used to-day, the type in the very great majority of modern cars, is of the lead plate with liquid solution.



This shows bulging and warping due to heat



Hydrometer syringe



Another view of heat effects

Caring for Your Storage Battery

The battery is really not a storehouse for electricity but a unit wherein certain chemical actions take place, producing a current of electricity for such use as the motorist may care to make of it. The battery is made up of positive and negative plates of a lead composition submerged in a solution of sulphuric acid. The latter is commonly called electrolyte and at 70° F. has a specific gravity of 1.30.

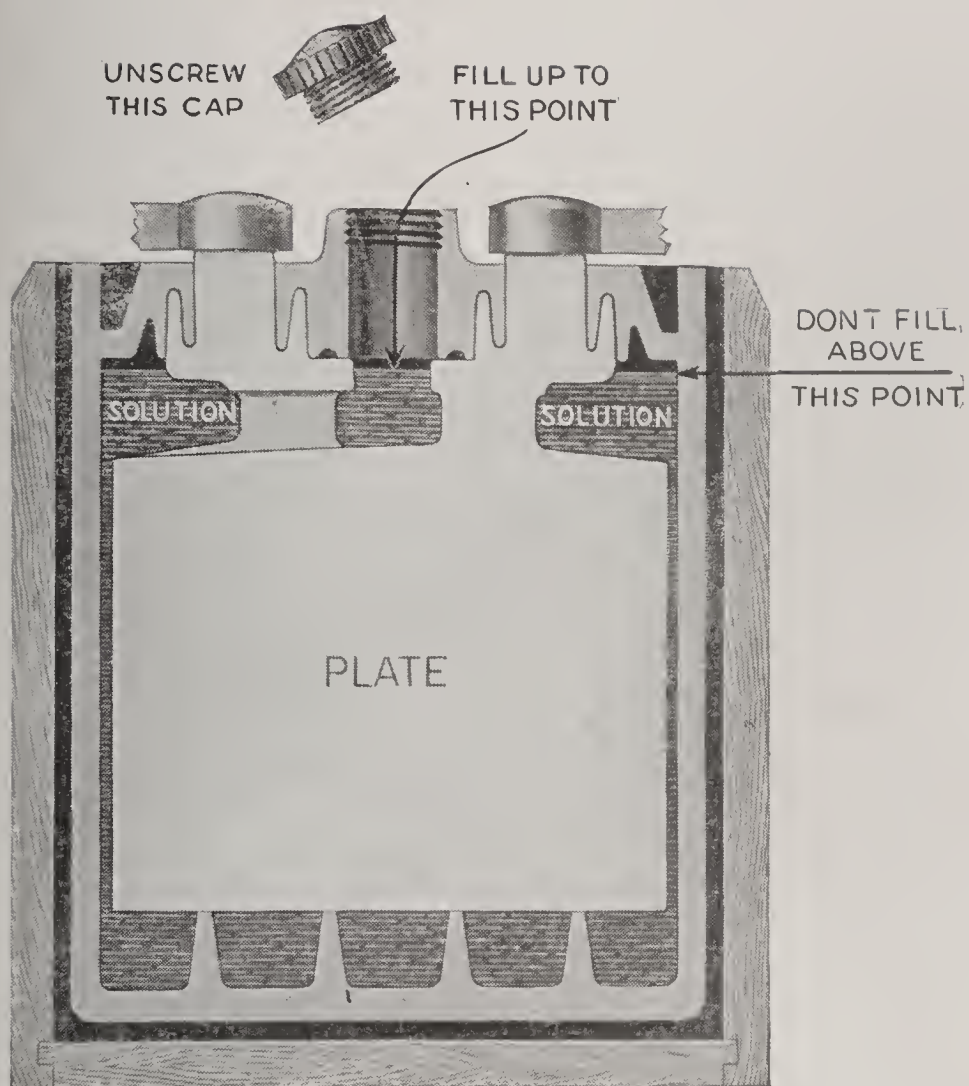
In action, the current leaves the battery through the positive plate and returns through the negative. These plates look like grid-irons, the spaces being filled with a lead composition. In the negative plates this is a spongy matter but in the positive it is a peroxide or reddish-brown color. Strips of wood or other materials separate the plates which are imbedded and enclosed in jars of hard rubber containing a solution of sulphuric acid. The jars are commonly designated as cells and a battery has any number of them, according to the power requirements.

It is the chemical action between the specially composed material in the plates and the acid solution that generates the electrical

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current. The action is all the time going on even when the current is not being used. But, while it is being used, the action is many times increased in volume and violence. Not only is current being created by this chemical action but a lead sulphate is produced and deposited on the plates. This substance is white in color and its presence weakens the action of the battery through withdrawing acid from the electrolyte. Thus the continual pouring out of generated current would, in its final stages, cover the plates with a thickness of sulphate deposits and leave no electrolyte—only plain water.

But when electrical current is sent into the battery from an outside source a reaction takes place and the sulphate deposits are driven from the plates back into the liquid in the form of acid. It is the continuous driving back and forth of these deposits which makes possible the continued chemical action producing electrical current. Hence the necessity of the generator. Also, the necessity for added water is shown in the fact that the liquid in the cells suffers evaporation, which is hastened



Cross-section view of a storage battery, indicating level at which solution should be kept

Caring for Your Storage Battery

by the heat created through the chemical action.

Just as water is required at frequent intervals, so it is also essential that a watch be kept on the possible leakage from the jars of the acid liquid. In case of leakage it is necessary to add sufficient acid to maintain a specific gravity of 1.30. If the battery becomes abnormally low through lack of water or leakage and shows lower than 1.15, it should be re-charged. Proper care saves these recharge bills, however, and proper care consists mainly in keeping water in the battery and cleaning the terminals with an eye on the wires to prevent short circuiting. The generator should be adjusted to meet the conditions of service so as neither to overcharge nor undercharge it.

The importance of distilled water cannot be too strongly urged. Rain water or water from melted ice may be used, but not just ordinary drinking or bathing water.

See that the clamps are securely screwed down and that the mounting is always perfect; otherwise, you may have a lot of broken cells

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which will cost money. Don't worry about the solution freezing providing the battery is always charged. When fully charged this electrolyte will not freeze until lower than 35° below zero is reached.

One of the frequent ills of a battery is caused by the formation of corrosion around the terminal wires. These should be kept clean and highly polished. If an acid substance begins to form, clean it off and grease the terminals well. I have seen batteries giving only half service because of this single neglect. Don't let yours lie down on you because of failure in this respect.

Help your battery by a little attention and it will show its appreciation by added pep and power in its current.



Cross-section of cell showing solution too low

CHAPTER XII

STARTING AND LIGHTING TROUBLES

Sooner or later most owners have trouble with the starting and lighting system and, when difficulty does come, look out. If the car owner of average intelligence will only study the system that gives him electric lights and cranks his motor, he will be able to keep it in good order and, when trouble does happen to develop, he will be able to find it and fix it.

The starting and lighting system is made up of two principal units—the generator and the starting motor. Sometimes these two are included in a single installation and again they are separate. In addition, there is the storage battery, charged by the generator. From the battery the current passes into the lights and to the starting motor to give it power to turn over the engine. Among the minor parts of

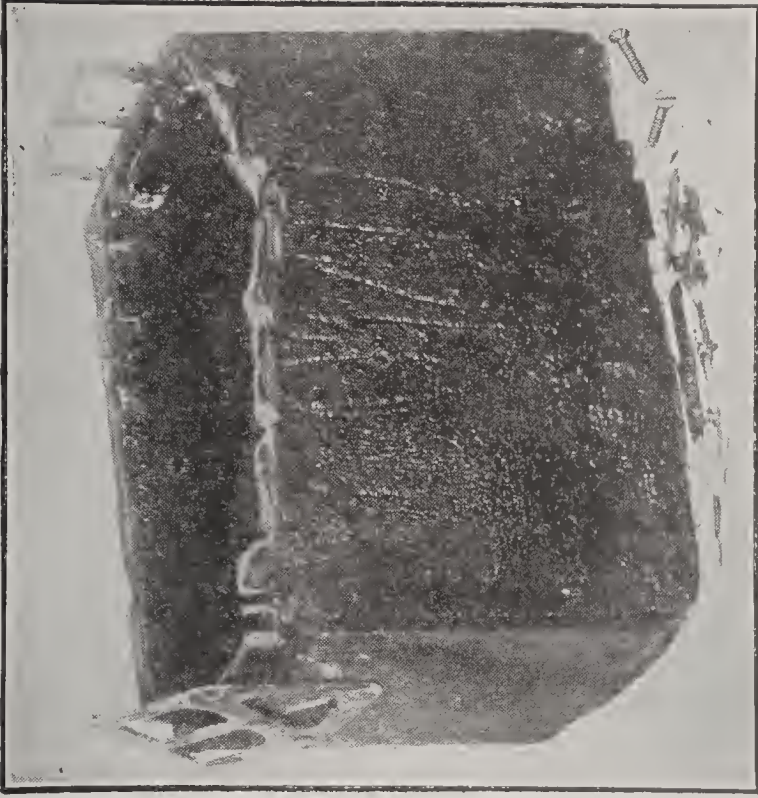
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the system will be found a cut-out, a device that is used to connect and disconnect the generator from the battery. There is also a device to regulate the flow of current from the generator to the battery, so that the latter shall not be overcharged. With the wires, switches and lamps, these make up the entire system.

In practically all cars built to-day it is the custom to place on the dash a little meter which tells the rate at which the storage battery is being charged or discharged. By means of this device the driver of the car can tell just how his starting and lighting system is functioning. Just as soon as the starter is thrown into action, the dash meter begins to register current flow, as the juice is being used to turn over the engine. The driver should keep an eye on this meter at frequent intervals and any sign of failure to register should be investigated. Any time that the lights are not being burned and the starter is not being used, the hand of the meter should register zero. Failure to register in this way may mean that the hand is bent, the magnets may be weak or the return spring in the meter is failing to



Sulphated plates, the result of non-filling



Effect of over-filling a battery

Starting and Lighting Troubles

function properly. Vibration and excessive voltage in the electric system often cause trouble in the meter. Unless the car owner is pretty well up in meter mechanics, he had better take the instrument to the service station and have the repairs done there.

Taking it all in all the starting and lighting system, as far as its mechanical make-up goes, is a pretty sturdy job. Mechanical troubles are seldom encountered. The bearings of the generator frequently wear and cause trouble until they are replaced. The linkage, if there is one, occasionally develops a balky fit. There is no reason why the car owner who is a reasonably good mechanic for the rest of the vehicle can't manage to make ordinary repairs in the starting and lighting system. The commonest troubles encountered in the starting and lighting system are short circuits or open circuits. When an open circuit occurs, there is no flow of current in the system at all. When the trouble is a short, the current flow is in the wrong direction, so that the function of the system is deranged.

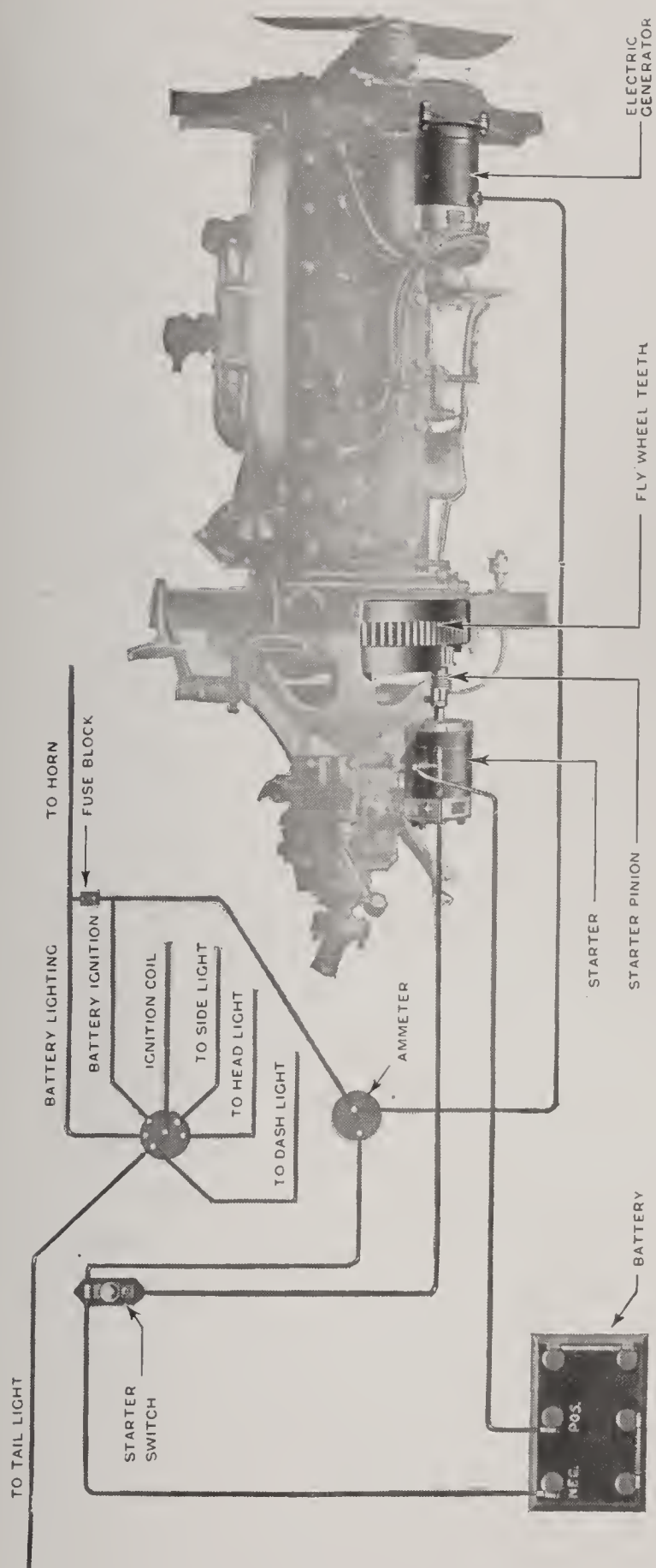
Every car owner ought to make it a practice

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to inspect carefully the whole wiring layout of his system at frequent intervals. You see if the insulation material of one of the wires happens to chafe through, the current will not reach the lamps or whatever other part it is intended to serve. Trouble of this kind can be caught in time, if the wiring is examined and frayed places are taped before the wire comes through.

There are two separate methods of handling the wiring problem in the starting and lighting system. In one, two wires are used to carry the current out to the place where it is needed and bring it back to the battery again. This is called the double wire system. The other system uses but one wire, the metal frame of the car being utilized to bring the current back to the source after it has served its purpose. In the single wire system, if one of the wires is stripped of its insulating material and touches metal, a short circuit is at once established. In the double wire system, two of the wires must be stripped of insulation to cause the short circuit.

In the double wire system the terminals are



Typical electrical wiring of a car

Starting and Lighting Troubles

to be watched in case of trouble. If one of the wires is poorly connected at the terminal, the whole system may be thrown out of working order. The terminals should always be kept clean and the wires tightly connected.

Of course the battery is a frequent source of trouble in the starting and lighting system. If the battery gets in such shape that it is difficult to turn the engine over and the lights burn with lowered brilliancy, go for the battery. If the lights burn all right but the starting is obviously there is some trouble in the part of the system controlling the starter. So, when the lights are dim, but the starter goes to it in good shape, the trouble lies in the lighting part of the system. Whenever trouble develops in the starting and lighting system, the first thing to go after it is to start at one end and work right along to the other.

In good many cases, where the lights seem to have gone bad, the seat of trouble will be found right in the bulbs. The filaments may have burned out or been broken, but, of course, two bulbs are not likely to suffer in this way at the same time. However, look at

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the bulbs first and then try the connectors that lead to the lamps; these may be loose or the contact points may be corroded. The next thing to examine is the wiring back to the switch. Look carefully at the insulation of all the wires. In the system using only one wire, make sure that it is firmly fastened to the metal that carries it. Some systems use a junction box and there may be a short in this or the connections may have rattled loose or become so dirty they don't function. In case fuses are used, one of these may have blown out. If, after you have put in a new fuse, trouble still persists, you can bank on its being in the system.

The various switches that are used in the starting and lighting system are also a source of trouble. They may have accumulated dirt, they may be loose or simply out of adjustment. At any rate look them over. In case a cut-out is used to regulate the current flow at low speeds, give this the once over. The magnetic points may be dirty and the terminals may be loose.

I should advise every car owner to keep a

Starting and Lighting Troubles

copy of the wiring diagram of his car always on board. With the help of this he can locate pretty nearly any trouble that may occur.

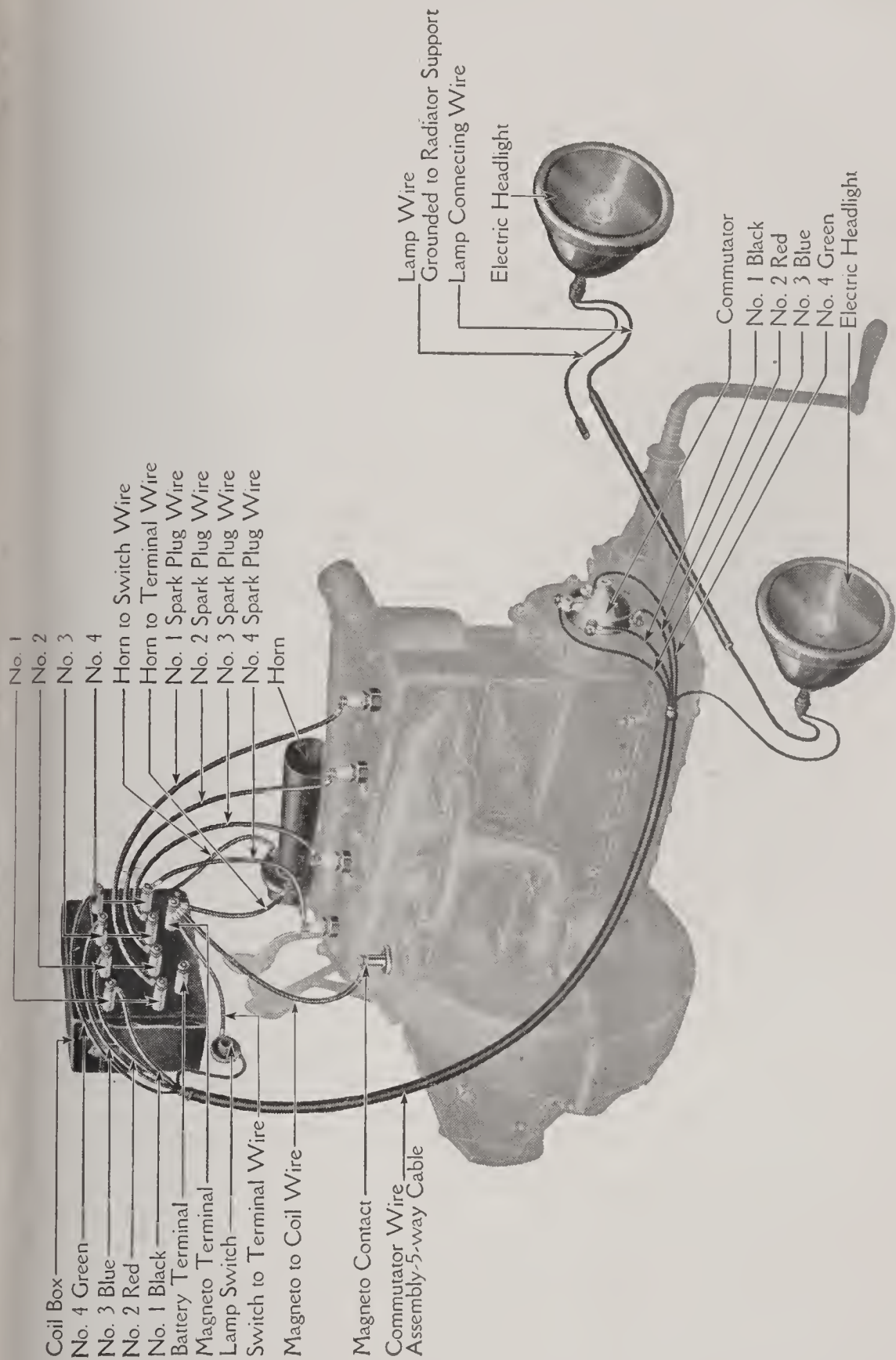
CHAPTER XIII

CONSIDER YOUR SPARK PLUG

SPARK plugs seem unimportant to the uninitiated. Most any sort will do, is the idea of the average owner—at least the “first-year” owner. The same man thinks he is saving when he buys “seconds” and “inspection-barred” tires. He takes a chance with his life by using tires not up to the standard. You take a chance with your motor in poor plugs. In the cases of both the tires and plugs, the first cost saving is lost by short life of the product.

With every motorist “the best is just good enough”—or it should be so in the matter of plugs and tires. The best plugs are not always sure these days, but the saving in buying the best is sufficiently large to justify my advice to get the true and tried plugs—always.

There are many plugs on the market and the



Coil-box and wiring on a Ford

Consider Your Spark Plug

owner should see that his car is equipped with a set of the best. By "best" I do not mean any particular plug; but I mean any plug which has been proven in the caldron of experience—a plug about which owners say little but words of praise—a plug which has shown its worth so strongly that manufacturers using the best equip their cars with it.

Spark plug troubles are most deceiving. Many owners have worried for weeks over poor ignition—poor engine performances—then to find after a long investigation that a poor plug was causing the disturbance. Plugs are so deceptive that good mechanics sometimes tear down engines and ignition systems searching for troubles which really lie in the spark-producer.

In racing hundreds of dollars have been lost because of spark plugs going bad. And this, after racing drivers had experimented with all kinds of plugs and had probably paid fancy prices for those very ones which lost the race. It used to be an old story with drivers to say that they lost such and such a number of minutes changing plugs. Even the

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star drivers had their troubles. They have them yet, too.

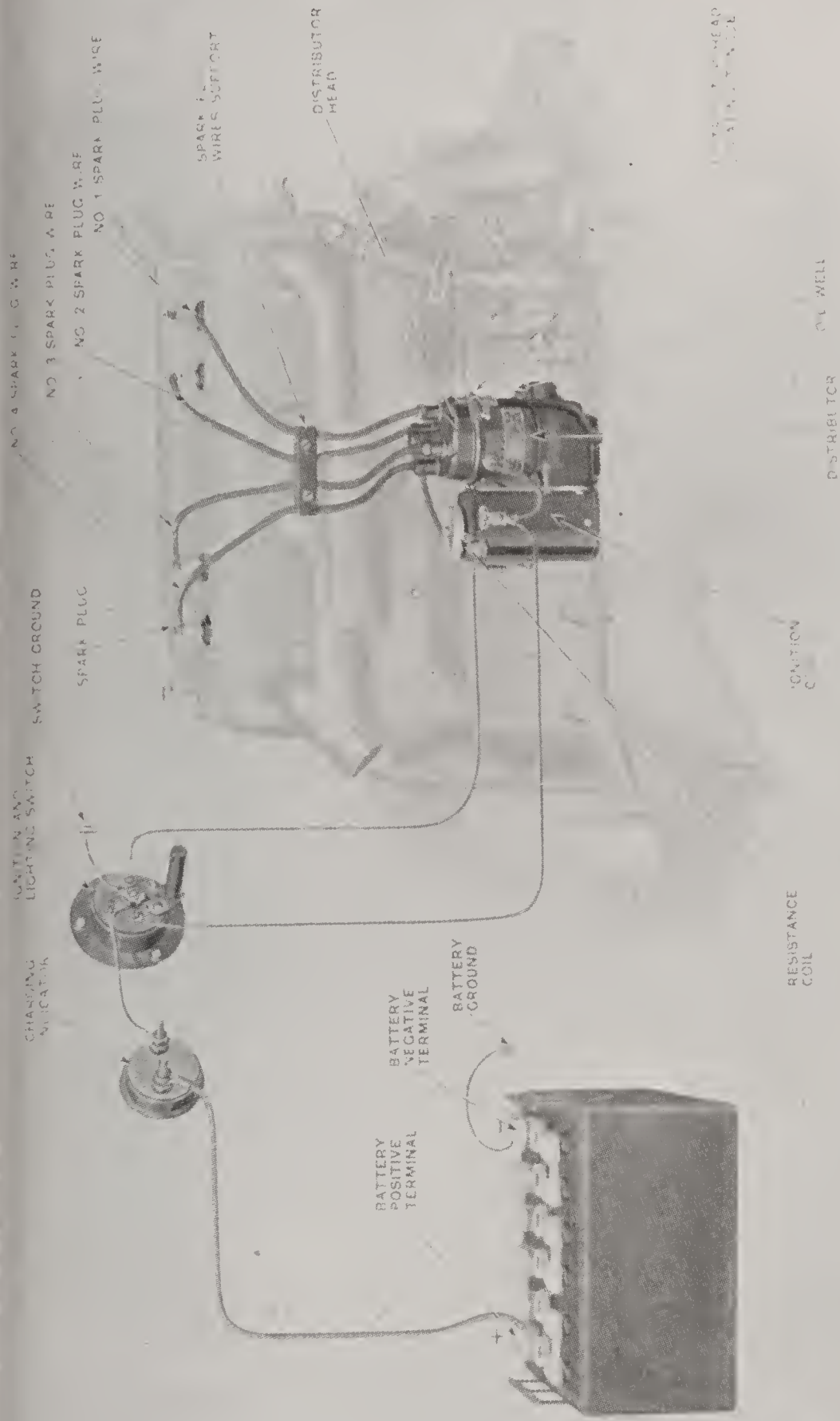
Enough spark plugs are built every year to equip many times over the cars of the entire world. Yet some people imagine a plug will last a lifetime.

All this leads me to repeat: Buy the best plug you can learn about. If you have had no experience, ask your owner friends who are careful in keeping track of such things. Ask many. Then form your conclusions. And, when you have secured the best, give them attention. Look them over every few days. May be they will be all right. Don't take chances, though.

Don't wait until your engine begins to perform poorly. Keep an eye on the plugs right along. Not only examine them with the eye, but now and then test them for the effectiveness of the spark. This may be done by disconnecting the ignition wires of all but the ones being tested. If the explosion is not good, make a close inspection of the plug.

SEE THAT YOUR PLUGS ARE ALWAYS CLEAN.

This is vitally important, especially when



An ignition system

Consider Your Spark Plug

your engine is running slowly and when you want a quick pick-up—a performance with pep.

BE SURE YOUR PLUGS DO NOT LEAK THE ELECTRICITY.

Here is one of the mysterious troubles with which plugs are afflicted. Frequently plugs look perfectly good, yet they are so saturated with carbon that the insulator changes form and electric leakage is so great the spark will not ignite the gas. This condition is difficult to determine, yet by testing each plug sufficiently it may be located. The only remedy is a new plug.

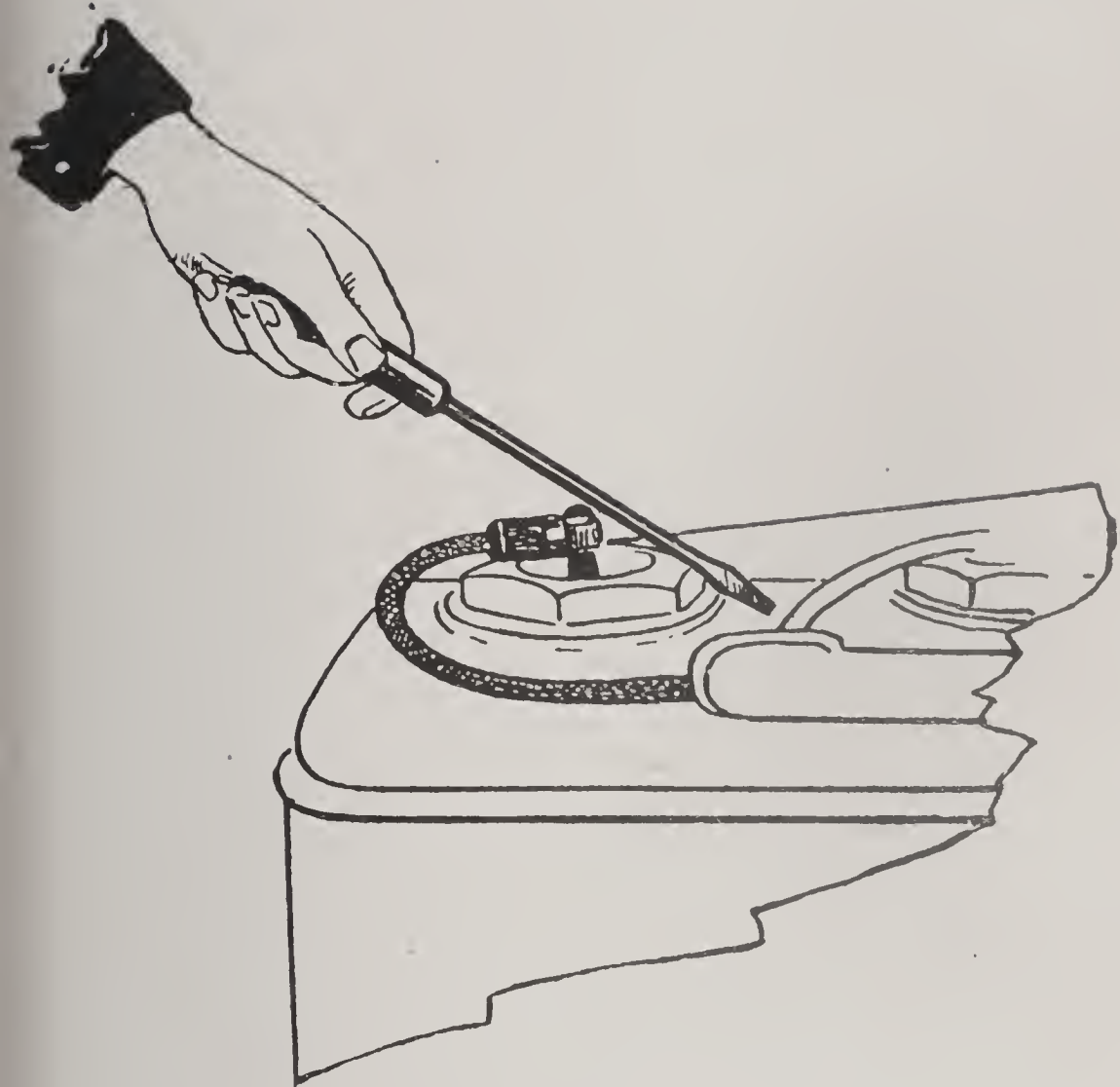
Many owners write me of their troubles and they blame the carburetors, valves, carbon and all kinds of things for bad performances. Frequently they try all the remedies for such troubles, only to have the poor performance of the car continue. And all the while spark plug inefficiency is the fault. The plug has simply ceased to perform its function, namely, to deliver a good hot spark sufficient to ignite the gas. This condition is due to porous insulation.

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Of course, no plug will work well when dirty and heavily coated with oil and carbon. The latter is really more dangerous than many believe possible inasmuch as the porousness of the material in plugs permits the carbon to be absorbed until the plug is so saturated as to cause the big leakage referred to.

Plugs should be cleaned by washing in gasoline and carefully scraping off all bits of carbon deposits with a knife. They should be thoroughly swabbed out with cotton or cloth and dried before being replaced. No soot deposit of any kind should be permitted. When a plug goes bad and fails to deliver sufficient spark for a "full of pep" explosion, it is no good and will soon cost more than a new one in requiring more gas and generally causing other troubles which multiply from any given fault which is not repaired.

If your engine starts poorly; if it lacks power and "pick-up," examine your plugs thoroughly before looking elsewhere for the cause. It may be carbon making the trouble or many other faults, but it is just as likely PLUGS. This is especially true if your engine



Testing Spark Plug

To detect and correct trouble with faulty ignition, first locate the cylinder or cylinders at fault. This may most easily be done by short-circuiting the spark plug or bridging from the motor head casting to the spark plug wire terminal with a screw driver, as here shown. By testing the various plugs it will be found that one of them can be short circuited without affecting the operation of the motor. This will indicate the cylinder at fault. The trouble may be either the ignition unit or the spark plug

Consider Your Spark Plug

is given to leaking oil around the cylinders or if you have recently had the carbon removed.

With your battery always properly charged, your wires properly connected, and the switches working correctly, poor ignition can be traced to plugs in ninety-nine cases out of a hundred. And in looking at your plugs don't be fooled by appearances, if your trouble is persistent. Test them thoroughly. Don't wait until things get bad to look over your plugs. At the first sign of loss of power—especially when using a lean mixture, driving slowly or trying for a quick pick-up—get busy with the plug examination.

The spark plug has only one thing to do—deliver a strong spark. But it must be petted, if you want it to do that all the time. And some owners go thousands of miles without giving much attention to their plugs! The one duty assigned the plug is as important as the feeding of gas for the proper performance of the motor.

Just one other tip, always have one or two extra plugs in your car no matter whether it is new or old. You can never tell when a plug

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will go bad and nothing is more aggravating than limping along with one cylinder not being fired at all. It is wasteful, and calculated to drive an owner to distraction.

Consider your spark plug, Mr. Motorist!

CHAPTER XIV

THE CARE OF TIRES

WATCH your tires, particularly during the winter months. Winter driving is hard on the pneumatics—so much more so than summer work that the difference in wear is decidedly marked.

The danger of winter driving is considerably greater—that is danger which might be attributed to tires—than in any other season of the year.

To avoid the danger due to weather conditions and to obtain the mileage which is due, owners must give careful attention to their tires. Every man doing winter driving should have chains. Anti-skid finishes are helpful, but they do not answer all requirements by any means. I would not drive without the antis, but I keep my chains ready and never hesitate to use them.

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I watch my tires like a hawk during the winter. I am careful in my driving also—more so than at any other season. From my experience I have evolved a few rules I always follow. I hand them to you for consideration.

Use non-skid tires.

Use chains when roads are slippery, or in snow.

Keep your tires always properly inflated.

Use extra precaution in driving; never speed.

Keep your brakes in perfect adjustment at all times.

See that your wheels are always perfectly aligned.

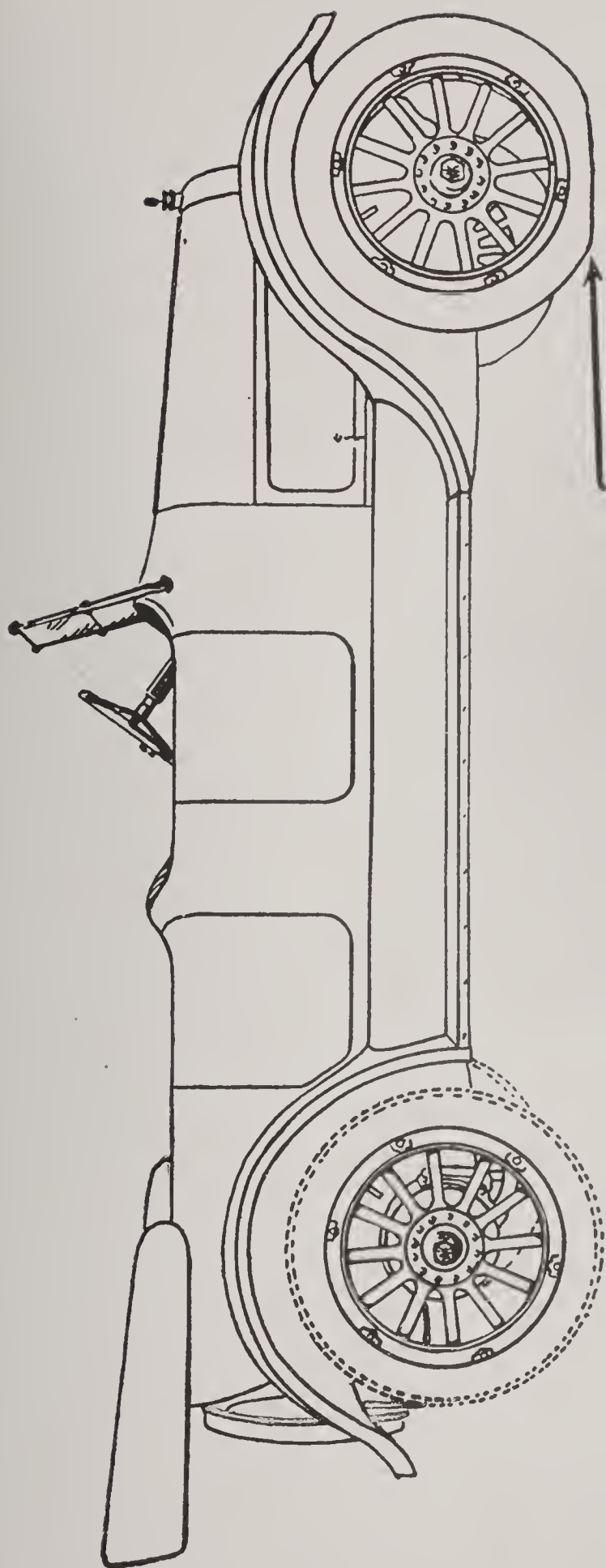
Wipe your tires dry and free them of mud whenever you enter your garage.

Use your clutch with care—never throw it violently.

Prevent skidding in so far as possible.

Keep your garage floor clean and dry: with the garage temperature around forty to fifty-five degrees.

The average motorist is not an expert, by any means, in the purchase of tires, to say



The Right Way

Keep the tires properly inflated

The Wrong Way

The Care of Tires

nothing of their use. Therefore, I do not think it amiss to suggest that non-skids be used on all four wheels during the winter. No matter what your experience may have been or what tires you use ordinarily, when winter time comes get good gripping suction casings. They will live longer and protect you better.

When it comes to inflation, always remember that there is no tonic for tires equal to air. It protects them and protects the motorist as well. Never drive without your tires being properly inflated. Get yourself a reliable pressure gauge and use it often. Don't be satisfied to kick your tires occasionally to estimate the pressure. You may be taking chances with your life when taking chances on your pressure. So be sure. Many accidents are due to deflated tires and fully seventy-five per cent. of repairs come from the same cause.

When a tire is not sufficiently inflated, the thin walls of the casing bend and knead. This is particularly true when ruts or obstructions are hit. The well-inflated tire bounds

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off obstructions without this bending and twisting of the walls. The fabric lasts much longer. The ordinary pressure should be around 20 pounds to the inch of tire. A 3-inch tire would take 60 pounds; 3½, 70; 4, 80 and so on up to 6 inches when 120 pounds would be correct. Cord tires are not quite so dangerous or susceptible to injury when not fully inflated, but they should not be neglected because of this. Cord tire pressure should be fifteen pounds to the inch.

Be mighty careful in driving. Do not go around corners fast. Do not start or stop quickly—be gentle and take your time and more especially so if the streets happen to be wet and slippery. Remember your life is in your hands—to say nothing of other lives—when the streets will not stand sudden stops, but shoot you one way or another.

Skidding is the bane of the winter motorist. It plays havoc with your nerves and sometimes kills the other fellow. A few ways of curbing, if not preventing, skidding are:

Don't apply your brakes suddenly on a slippery road.

The Care of Tires

Don't use your brakes in making a sharp turn—slow down.

Don't follow another car too closely—always be sure of plenty of space in which to stop, if anything happens to the man in front.

Don't fail to turn your front wheels in the same direction the rears are skidding. Go with the skid and not fight against it.

Keep your brakes in perfect adjustment. Don't slam them on suddenly but slow down and gradually apply the brakes. Throw your clutch out slowly, for, if you throw it violently, it has the effect of a heavy sledgehammer blow on your tires, putting on an extraordinary strain. Be sure your wheels are in proper alignment, for there is nothing which will grind up your casings like wheels out of alignment. There is no excuse for the condition either. Use a cord and test out your alignment every now and then; don't wait until the tires begin to show the wear this fault causes.

Riding car tracks is the most common fault of drivers, and it is costly. Rails wear down the siding of tires, chew off the rubber and

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grind in dirt and water. Water plays havoc with tires when the rubber is rubbed off and it gets to the fabric. Oil, dirt and small stones are ground into the fabric by car rails. All make for less life of the casings.

After a drive on wet roads, in snow or mud, rub your tires off when you come in. Get them dry and free from water, oil, dirt or other substance. Doing this is removing the enemies which eat up tires and cost you money. It takes little time and saves much. Keep the temperature of your garage about 40 to 55 degrees—too much heat is as dangerous as too much cold. The chemical action resulting from either condition causes deterioration of the rubber in tires.

Another important consideration in the life of tires is the quick repair of punctures. Always stop immediately when you get a puncture. It will cost five to ten dollars every block you drive, if you persist in continuing after a puncture. You not only chew up your tube but injure your casing materially. If you cannot change tires or repair your tube on the spot, it is far better to remove the tire

The Care of Tires

and continue on the rim than on the deflated casing.

Always keep a close lookout for breaks, cuts and bruises on the surface of your casings. When you sight them, repair them at once, even if you have to go to a shop to have it done. Sand and moisture are kept out in this way and in winter it is more important to keep out these harmful ingredients than in summer. They are bad enough at any time.

If possible, carry your spare tires in a casing, as light and weather injure rubber materially. Keep your garage floor free from oil, water and other substances. Change your wheels around now and then. When your rears begin to wear, switch to the front, if all are of the same size, or switch from right to left.

Tire care means dollars. So give careful attention to your casings and tubes.

All of these rules for the care of tires in winter apply in summer except those relating to temperature.

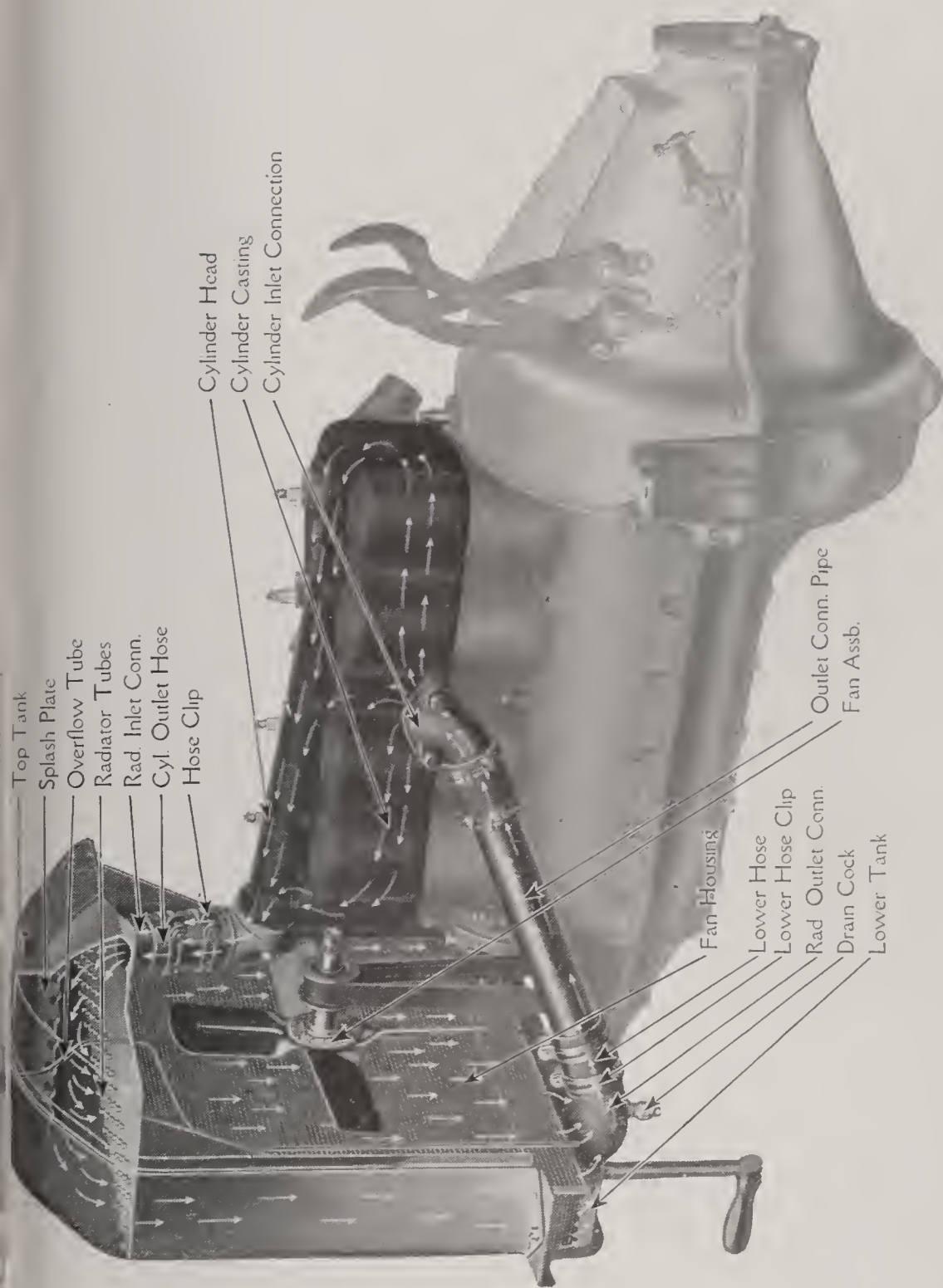
CHAPTER XV

AVOID OVERHEATING THE POWER PLANT

NEXT to improper or careless lubrication, the most common trouble of motorists is overheating of the power plant. Many inexperienced drivers are especially careless about their cooling systems.

Adequate cooling is just as essential as lubrication. Water must be fed the motor just as oil and gas are fed. Carelessness in this respect imposes a heavy penalty. I have seen many cracked cylinders due to this neglect, to say nothing of valve trouble, cracked spark plugs and impaired engine power.

Motorists must be watchful of the cooling systems. Plenty of water must be in radiators at all times. Care should be taken in keeping all parts of the system in proper shape in order that they may successfully perform their functions.



How a motor is cooled by the thermo-syphon system. Water follows the arrows

Avoid Overheating the Power Plant

Few motorists realize the extreme heat which comes about through the explosions of the gasoline mixture. At one stage of the power stroke the heat in the cylinders of an engine passes 2000 degrees. This heat is almost beyond the imagination of the ordinary motorist who has given no study to the actions of his engine.

With such extremes of temperature the necessity for adequate cooling becomes manifest even to the tyro. This cooling is obtained through the combustion chamber and cylinder being surrounded by a jacket in which cooling water circulates. If this water is not kept at a temperature so that its functions may be performed, damage is done quickly.

Though the temperature inside the combustion reaches more than 2000 degrees, it decreases as the piston advances and the gases expand. Near the end of the piston stroke the exhaust valve opens and both the pressure and temperature drop considerably. However half of the total heat must be carried off by the water system. The heat of a

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gas engine is four times that of a steam motor.

Ordinarily, overheating is caused from one of the following conditions: Carbonized cylinders; hard driving for a length of time on low speed; late ignition due to a retarded spark; defective ignition system or connections; insufficient oil or a bad grade of oil; improper carburetor adjustment; slipping or non-working fan; improper circulation of water due to clogged radiator tubes; racing the engine; clogged muffler or leaky rubber connections.

The first maxim for every motorist should be:

FILL YOUR RADIATOR DAILY WITH CLEAN WATER.

It is a good thing to get one's self in the habit of filling the radiator daily. Don't wait until signs of overheating are manifest. Fill the radiator before leaving the garage every time you go for a drive. Once you get the habit, it is no trouble.

Greatest efficiency in cooling systems is reached when the water is near the boiling point. As a consequence, drivers should not

Avoid Overheating the Power Plant

become unduly alarmed if the water boils a little after a hard pull up a hill or through sand. But if this boiling persists under ordinary working conditions, it is a warning that something is wrong. Investigate and repair at once. Bad driving—that is without consideration of conditions under which the spark is being operated—causes more overheating than anything except carbon.

If a driver discovers his engine overheating, he should first allow it to cool off and then fill the radiator with cold water. He should then study his spark conditions and test the cooling system by various changes of the spark. If that does not stop his trouble, he should open the pet cock at the bottom of the radiator and thoroughly flush out the entire system under fair pressure. After this the rubber hose should be removed and cleaned. Then re-connect, tighten the hose to the utmost, re-fill the radiator and test again.

In case further overheating is manifest, then you may be sure that it is due to lack of lubrication, carbon, bad ignition or similar trouble. The best thing to do in such a case

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is to check over the ignition system and see that a proper adjustment of the carburetor exists. If the cylinders are full of carbon, that must be cleaned before the cooling system will work properly, no matter if all the other faults are remedied.

The two systems of cooling an engine in general operation are the thermo-syphon or natural system and the pump system. Of 171 cars recently examined 117 have pump systems and 54 the thermo-syphon. The air-cooled car is another matter and is not referred to in this discussion. The pump systems allow of lighter weight because less water is needed in the radiator, while the water pipes and cylinder jackets may be smaller. The pump is driven mechanically through a connection with the crankshaft and water circulates more freely as greater speed is shown.

Whether one is having trouble with overheating or not, one should clean out the radiator and entire circulating system every two or three thousand miles of driving. Make this cleansing thorough so that any sediment may be washed away and the clogging of tubes pre-

Avoid Overheating the Power Plant

vented. To flush out the water jackets, close the radiator pet cock and open that of the side inlet, allowing the water to flow through under ordinary pressure.

One of the most interesting facts in connection with the study of gasoline engine principles comes from figuring the distribution of heat generated. In a work by Thurston on "Heat as a Form of Energy" it is figured that only seventeen per cent. of the generated heat in a gas engine does useful work; fifty-two per cent. is transferred to the cooling system, with sixteen per cent. lost in the exhaust gases and fifteen per cent. lost by conduction and radiation. As a result of this, it is shown that the cooling systems must take care of sixty-seven per cent. of the heat expelled from the engine at high temperature.

It is a fact that sixteen per cent. of the heat goes to the exhaust which makes for the use of a muffler cut-out in speed work. In ordinary driving this use of a muffler does not cut much figure. But when it comes to a race, where maximum speed is called for, the muffler is opened wide to facilitate the escape of

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this percentage of heat. With the muffler in operation there is some resistance to the escape of gas. I do not advise the use of a muffler cut-out for touring, because of the noise made and the fact that the resistance is so small as to cut little figure.

One of the most useful devices ever made for the driver is a motometer which is placed on the radiator cap and which tells at a glance the condition of the cooling system, or rather its workings. These motometers have thermometers which give the temperature of the water with warnings thereon as to the system. An owner may glance at this instrument and tell the exact condition of the water in his system.

CHAPTER XVI

PREPARATION, THE BIG ITEM

I HAVE been constantly asked how I win races. So many motorists have shown a curiosity regarding the work of a driver that I am going to make a "confession" and "expose" the whole racing business.

There are but two items to be catalogued in telling how to win: preparation and skill. Of the two the most important is preparation. Lack of infinite pains in this respect has lost more races than all the daring and skill of the world combined. So if there is one word which I would drive home in the minds of all drivers it is PREPARATION.

The same holds true in the matter of touring and of ordinary city driving. If every owner or chauffeur gave one one-hundredth as much attention to preparation as a driver before a race, few trips would be spoiled by

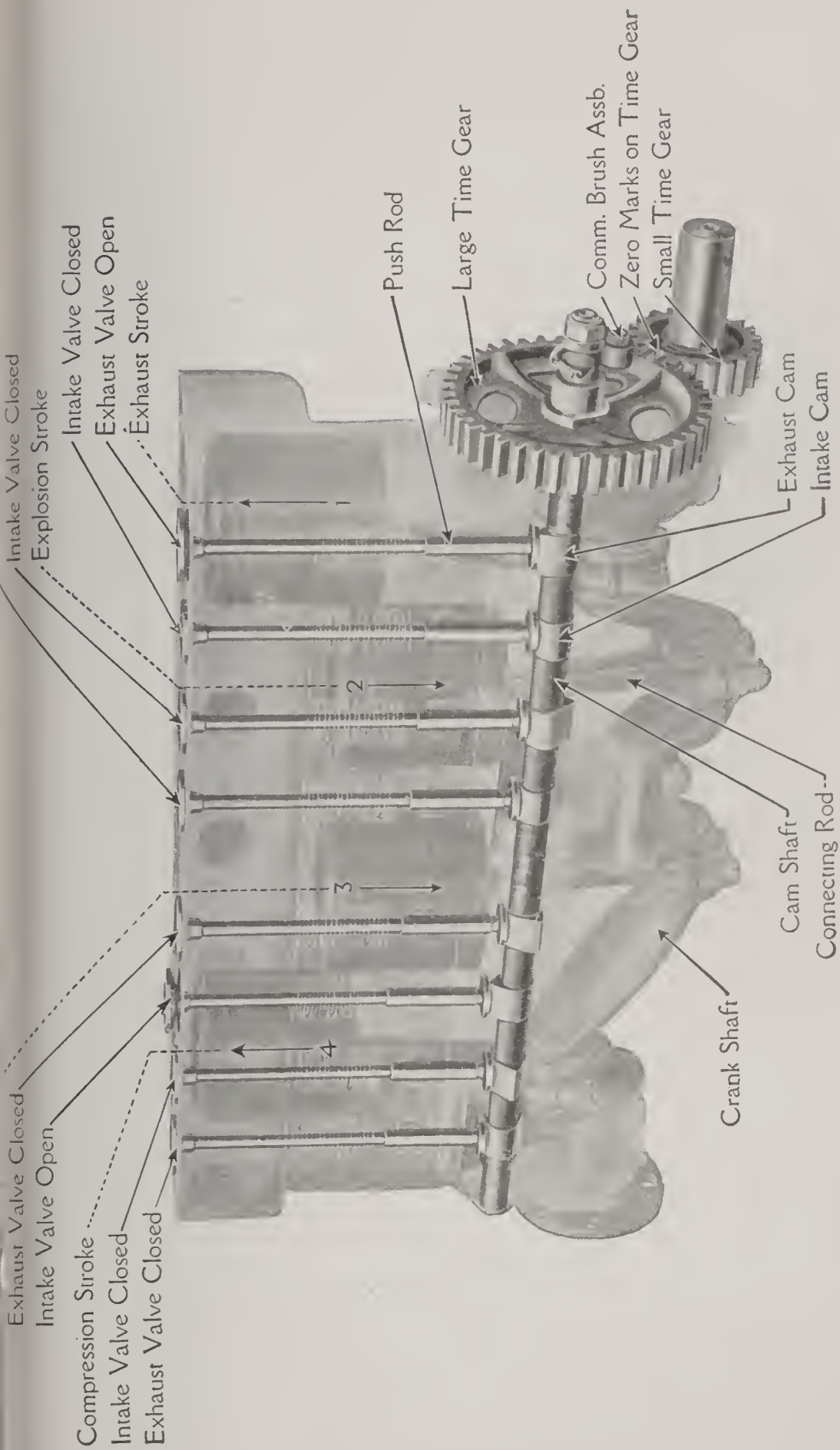
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breakdowns and repair bills would cease to be a bugaboo for the average owner. In fact, the majority of repair shops would go out of business.

I now contend and have always contended that three-quarters of the money spent on repairs is wasted through neglect in preparation for driving. Most of the joy of motoring is taken from it through this lack of forethought. I frequently make long trips—sometimes across the continent—and have little if any trouble. Why? I prepare. You should do the same. Even if you only use your car around town, keep it in a state of preparedness.

Every racing driver must be a good mechanic to be successful. He must know the “feel” of his car at all stages. He must know how to make it ready for a contest. He must have infinite patience. He must be a worker. He must leave absolutely nothing to chance. He must use his eyes, his ears, his hands, his feet, his sense of “feel” and his experience. To that he adds his skill and daring.

I know I am called a “daredevil” and



The operation of a Ford motor, with special reference to valves and the cylinder assembly, showing the correct position of the valves with time gears properly set; also relative position of pistons in their strokes. The firing order is 1, 2, 4, 3

Preparation, the Big Item

pointed to as a man lacking the sense of fear. But I am not. I take chances, of course. Every racing driver does. But I eliminate as many of the chances as possible through thorough preparation. I have had two or three accidents recently, but none were of serious consequence—partly due to foresight and partly to experience. Any man who goes faster than one hundred miles an hour is taking chances, but if he exercises great care in advance, the chances against him are reduced.

I learned my lesson years ago. Before a race I personally see that my car is right in every single respect. Every good driver does the same. A little neglect not only may mean the loss of a race and purse, but of life. It sometimes takes a week or more to prepare a car. Certainly for the first event of a season it means a month; and a month of hard work it is, too. The men who win nowadays are those giving most work to this before-the-race duty. The man who makes a success of his touring is he who gets ready, too. It is the same in everyday driving.

Preparedness means seeing that your car

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is in perfect shape. From the radiator to the rear axle every part must be adjusted, carefully set and thoroughly tried out. Every part must be acting perfectly to get winning results. Frequently engines are torn down and re-built time after time to make for perfection. Transmissions, clutch, driving gears, brakes, springs, wheels, steering apparatus and all the various parts of the car, aside from the motor, must be given the same care as the engine. All must be tested to the limits. I have often seen drivers re-build cars the night before a race, after discovering some flaw or some lack of attention to a minor matter.

What profiteth a driver to have world's record speed, if a flaw develops in a race; if a gasoline line breaks, because of failure to tape it securely or some other detail is overlooked? In touring the majority of troubles come from carelessness and neglect. Dirt is allowed to accumulate; pipes become clogged; cars squeak; tires blow out; engines overheat; valves knock; motors lose power; springs break.

Preparation, the Big Item

Before I start on a tour, I see that my motor is clean—both inside and out. All carbon must be removed. Valves must be ground and accurately adjusted. The ignition must be full of pep. The carburetor must be clean and adjusted for maximum efficiency. The radiator must be cleansed of all foreign substances. There must be oil everywhere it is required. Grease cups must be filled. Wheels must be inspected for true alignment. Tires must be at proper air pressure. The battery must be fully charged; the generator nicely adjusted and the starter polished of all dirt. And these things must be kept “just so” to get all the joy out of life that motoring affords.

With a car put in perfect shape for racing, it then becomes a question of speed and of skill. One must go the limit of speed, always bearing in mind the distance of the race and figuring upon what amount of “nursing” is required for such a distance. Some drivers know nothing but speed. They win few races. Some know little, but trust to their daring. They seldom win. The consistent winner is

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he who mixes brains with gasoline and drives with his mind busy figuring every possibility as it comes up—the man who restrains himself and his car and only does what he knows he can do and keep within the bounds of safety.

Judgment of pace is one of the prime requisites of racing. This is just the same as horse racing. The jockey must know how much his horse can stand and how much he has in reserve. The racing driver must know what his car will stand. It is because many drivers lack this quality that they are brilliant only “in spots.” I do not believe I have ever made a record which I could not break to-day under the same conditions.

When it comes to touring and cross-country driving, I am absolutely against speed. Touring cars are not generally provided with the special features which make for the protection of the racing man. Consequently, fast driving on the road is dangerous. Cars are built to withstand all the knocks of ordinary driving and stand up under ordinary strains. They are not built to withstand the

Preparation, the Big Item

terrific punches of racing—that is, all the minor features are not strengthened with this idea in view. I drive my touring cars at twenty to thirty miles per hour and am satisfied. My cars stand up. I have little trouble.

If every motorist would drive at a reasonable rate, his car would be good for one to three years more satisfactory running than if he speeds. Nothing kills a car as much as speeding. The owner who wants to keep his car several seasons and really enjoy driving will not speed. That motorist will bear in mind the story of the racing driver's preparation. He will watch his car and save repair bills and he will get real pleasure from his machine.

CHAPTER XVII

THE REPAIR KIT FOR TOURING

DESPITE the fact that cars are made nowadays to stand long trips without special provisions for care, it frequently happens that minor troubles will be met. For this reason it is essential that the tourist be able to do emergency work and, consequently, carry with him a small assortment of first-aid materials. A small quantity of tools and minor parts should always be in the car—especially when out for a week-end, a day or a month trip.

When an owner receives his car, there is always an assortment of tools such as a pump, jack, monkey wrench, screwdriver and a special set of wrenches made to fit the parts of his particular car. Many owners allow these to get lost, but the good careful owner will see that they are carefully packed and

The Repair Kit for Touring

always in the car. They do not weigh much and if well-wrapped will not rattle or become an annoyance. It is not essential that a small machine shop be in the car, but a number of tools are necessary.

The wise owner will see that his special set of tools is always with him and when he goes on a tour he will add a few specials for which he may find use any minute. For instance, the wise owner will have a few chain links and a chain tool for his anti-skid equipment. This saves annoying and damaging knocks against mud guards and insures a good fit for chains at all times. A file should always be on hand for adjusting ignition points and cleaning various parts of the car. Of course, pliers are absolutely essential for hundreds of purposes.

A good heavy hammer is frequently needed to remove rims. Be sure of the weight of this particular article. A small square of plank-ing will often be found important in changing tires on sandy or muddy roads where there is a tendency for the jack to sink in the loose dirt. A strong handle should also always be with

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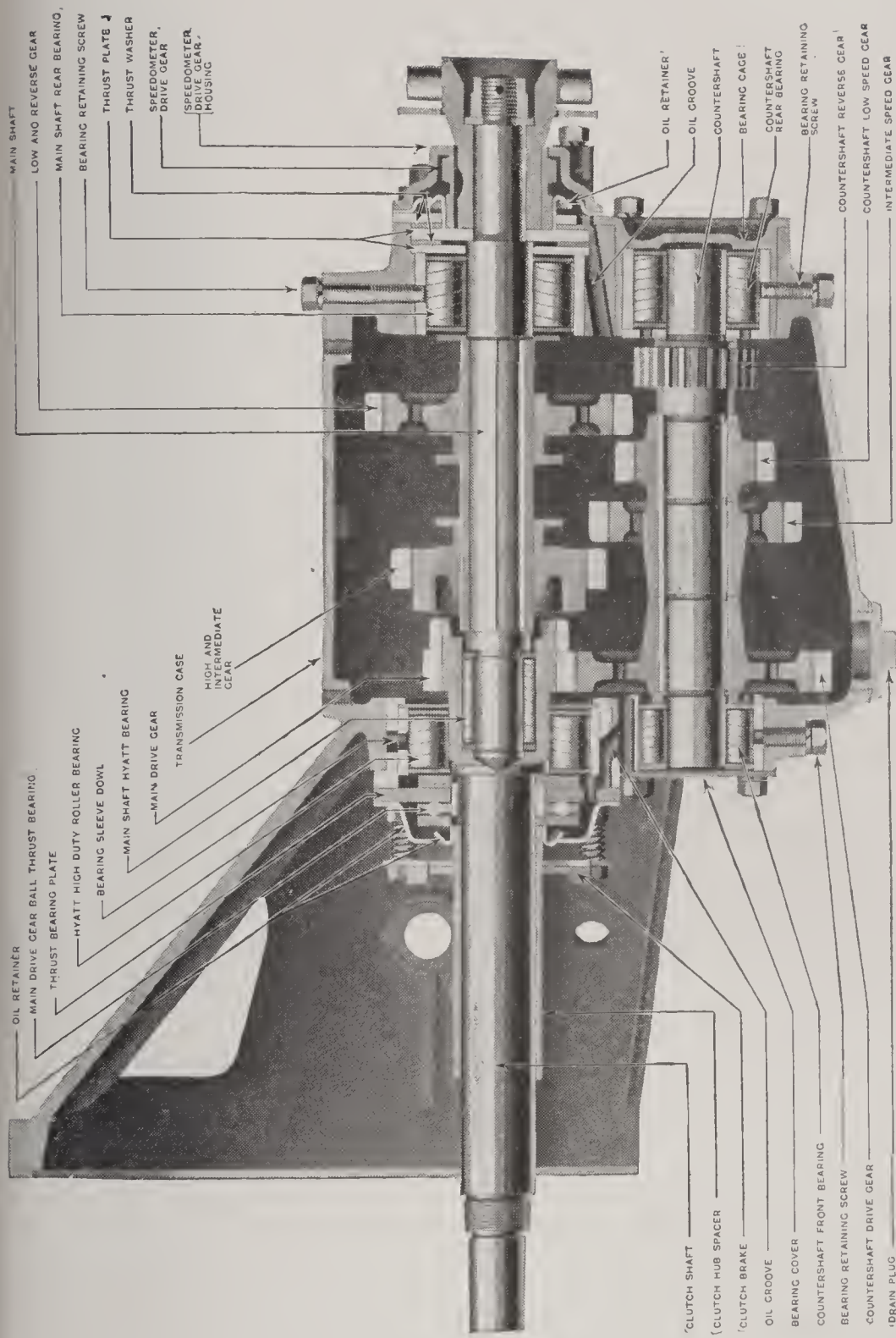
the jack. A folding pail should be in the car, for sometimes water is not to be had except from a creek along the roadway and one should always be prepared to add water in an emergency.

A quantity of waste or rags should always be on hand for cleaning delicate parts of the car and also for cleaning the person. When one is called upon to change tires or work around grease or oil, one quickly gets in a far from pleasing condition. A little gasoline will assist in removing obstinate grease or dirt. A tow-rope should always be in the car when going any distance. It not only comes in handy in case of accident but can be used to wrap around tires on muddy roads or deep sand. An extra set of light bulbs and fuses should be a part of the tourist's equipment.

Here is a list of requisites which take up little room, but which provide a peace of mind which goes to make touring a pleasure:

AUTOMOBILE FIRST-AID KIT

Wrench for adjusting ignition interrupter points.



Sectional view of a modern transmission system

The Repair Kit for Touring

File for cleaning above points.

One set of ignition brushes (in box labelled).

Several extra spark plugs, cleaned and adjusted, ready to use.

Tow-rope.

Half dozen valve plungers for inner tubes.

Three-in-one tire valve tool.

Tire pressure gauge.

Jack and handle (be sure about the handle).

Squirt can full of oil.

Voltmeter or hydrometer for testing battery.

Box of assorted nuts.

Box of assorted cotter pins.

Box of assorted cap screws.

Box of assorted washers.

Spool of copper wire and one of soft iron wire.

Full set of electric light bulbs.

Bag of clean waste or rags.

Two blocks of wood, 6 x 12 x 1.

Full set of fuses, if fuses are used.

Folding pail.

Chain tool and several cross links.

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The nuts, cap screws, washers and cotter pins of regular assortment and packed in boxes are carried by supply stores. These and several of the other articles may be packed in a cigar box for stowing away.

CHAPTER XVIII

PROTECT YOUR CAR IN THE WINTER

THE cold weather bugaboo is a terror. Many motorists lay up their cars. Others battle the enemy. I am in the latter crowd and I have been for many years. I have studied the problems offered by winter. From this study I offer those who brave the cold suggestions to make the fight easier.

Protect your radiator and circulation system.

Take care of your battery.

Install some kind of good priming device.

Watch your oils and greases—lighten them.

Be particular in the care of your tires.

Heat your garage.

Secure a windshield wiper.

Buy some of the well-tried comfort warming devices.

The most important thing to do is see that

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your radiator has a non-freeze mixture. The best for weather which is not colder than five below zero is 15 per cent. of alcohol, 15 per cent. of glycerine and 70 per cent. of water. If it gets much colder increase the glycerine and alcohol five per cent. each. You should renew this now and then, for alcohol will evaporate and you must allow for that. By keeping this mixture at the proper stage, you will save many times its cost in avoiding repairs on your radiator.

In addition to the mixture in your radiator, I should say the use of a radiator cover is quite essential. In the colder climates I would also suggest the use of a hood cover as well. These covers hold heat within the engine when you stop for a short time and make starting easier. If you do not care to purchase a hood cover, you should use a robe over the hood. I have seen a number of robes with fasteners attached, so that they may be held in position.

A number of new heating and priming devices are offered the public by various manufacturers. They cost little and will pay for

Protect Your Car in the Winter

themselves in gasoline saved in starting, to say nothing of the added comfort. Nearly every one of these devices have good points but your dealer can tell you just how thoroughly they have proved themselves by actual use.

If you do not want to go to this expense, you will find starting on a cold morning easier by priming your car and heating the intake manifold with a rag soaked in hot water. If you have electricity in your garage, you might install a small heater under your hood and leave it on at night. When your motor starts, leave it idle for two to five minutes to heat up thoroughly and get the oil flowing properly. Do not race the engine.

It is important to keep your battery fully charged. Use your starter as little as possible and drive as much as possible in daylight to charge it further. Chemical action is slow in cold weather. More current is required in turning over your engine. You burn your lights longer and generally call on your battery for much more service. Hence, it is quite essential that it be kept fully charged.

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By all means test it at least one time a week to see what it needs. Then supply the needs.

Winter driving requires thinner oils and greases. Figure out just what oil is best for your particular car in winter and stick to that as long as results are good. Too thin oils are as dangerous as too heavy oils. Consult your service man on this point. This applies not only to the engine but to the clutch and transmission.

If you have heat connected with your garage, see that it is turned on during the cold nights. If you have no heat, you should arrange for some. It will save lots of work, worry and trouble and keep your car in running condition. In the rain or snow a windshield cleaner is essential and many good ones are on the market at moderate prices. They make it possible to drive with comfort and care. You will need to use your chains frequently. Look them over and see that all broken links are repaired.

As I have said, winter weather is a terror to tires. You find so much more water and

Protect Your Car in the Winter

snow that you should give extra care to your tires. See that all cuts are promptly filled and keep out sand, dirt and water, as the fabric is more easily eaten up now than in summer.

For comfort a number of devices may be obtained at your dealer's. I would surely suggest a heater to attach to your battery or exhaust. Then there are electrical attachments to fasten on the steering wheel to warm the fingers. The feet and the hands suffer most from winter driving. Protect them.

ANTI-FREEZING MIXTURE

In freezing weather the water circulation system should be filled with one of the following anti-freezing solutions:

For temperature not lower than 5 degrees below zero:

Wood Alcohol.....	15 per cent
Glycerine	15 per cent
Water	70 per cent

For temperature not lower than 15 degrees below zero:

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Wood Alcohol.....	17 per cent
Glycerine	17 per cent
Water	66 per cent

About $6\frac{3}{4}$ gallons are required. Alcohol should be added occasionally to make up for evaporation.

CHAPTER XIX

OVERHAULING THE CAR

No matter how careful some drivers may be, in certain things, they are all inclined to neglect certain parts of their cars. The average driver is careless about little irregularities in the engine. The poor driver is ignorant of the things which go to make riding easy and pleasant. It doesn't make any difference to which class you belong, you should rejuvenate your steed of steel every now and then.

Right here I'll slip you a little tip that will secure better work for you and also save you money. Have your car overhauled during the early part of the fall months, while the shops are trying to keep full forces of mechanics. They don't have rush jobs for tourists in a hurry, so they can give you more time and more careful work. At the same time, they will generally charge you less than in the busier seasons.

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Of course, you may still get a world of work out of your car before you lay it up for the winter, if you do this. Nevertheless you owe it to your comfort to have your car gone over early in the cold months, to say nothing of owing it to the car and to your purse.

Maybe you can do the work yourself. I want to help you all I can with suggestions.

The first thing is to inspect your car for rattles in the body, springs, wheels, top, brakes, doors, running boards and fenders. You will be able to eliminate all of these yourself. It may mean a bit of work in overalls or an old suit, but it will also mean a distinct saving to your purse. And really you will have considerable fun in doing it, and, besides, you'll learn a lot of interesting points about your car.

Go over your wheels carefully and see if the long dry summer has caused the spokes to shrink. They give out an irritating rattle when in this condition. The remedy is easy. Either use one of the compounds sold especially for the purpose, or give a blacksmith a job.

Examine the shackle bolts at the ends of

Overhauling the Car

your springs, but, before tightening them, pry apart the leaves of the springs and grease thoroughly with a mixture of heavy oil and graphite. Well-greased springs make a world of difference in the riding of your car, as well as stopping squeaks.

The bows that carry your top may make exasperating noises. Strap them to end this annoyance.

Line up your wheels by the use of a cord. This saves tire wear and makes steering easier and safer.

Get under your car and thoroughly investigate the way the body is bolted to the frame. See that the felt cushions between the metals are renewed where worn, and generally tighten up every bolt connecting the body and chassis. Make the doors fit snugly, and oil the hinges to prevent squeaks. Then tighten up every bolt holding the fenders—loose fenders are common causes of noise and easily remedied—and tighten your windshield. If you have scattered your tools loose in their box, rewrap them so they won't contribute to your nerves by clashing with one another.

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If you do all these things properly, you will eliminate the greater number of annoyances which disturb the composure of autoists. The cost of this is negligible, the added joy immeasurable—especially if you have been a bit careless.

You have one other part of your machine which you can fix yourself at little or no cost. This is the electrical system. Cleanliness in your electrical equipment is absolutely essential. Many a selfstarter has refused to work because of dirt in the generator or in the connections. Going over your equipment is easy. Take it item by item, with care.

First, clean all your spark plugs with a gasoline bath and scrub with an old toothbrush. Dry carefully and reset the firing points.

Turn next to your distributor and see that it's carefully cleaned. Use a soft cloth or chamois.

Now go to your generator and starting motor. Clean it thoroughly, examine the brushes and replace the worn ones. Remove all the carbon and other deposits from the housings and carefully re-dress the commu-

Overhauling the Car

tator. If you're afraid to tackle this ticklish job, let an expert do it.

Your wiring should be carefully inspected. See that all insulation is perfect and especially look out for frayed parts which lead to short circuits. Clean and secure thoroughly every terminal and every connection. Have your storage battery tested and renew it, if necessary—this may save a lot of money later. If the battery is very old, you may need new plates. Better have it examined at a service station. Examination costs nothing and may result in a big saving from a later trouble.

When all this is done you may turn to your transmission and running gear. No expert is needed here except in rare instances. Briefly, you should take up lost motion in your steering gear and feed it a bit of castor oil. Inspect, clean and adjust the clutch. If this is of disc plates, a few drops of oil will help. Clean your transmission case and gears. Clean and oil the universal joints and differential. Adjust your brakes and inspect the linings. Clean and grease your wheel bearings. Clean your muffler. Remove all dirt

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from your dust pans. You should even remove your oil case and clean it. Remove all the rust from tire rims and re-paint them. Be certain that you have plenty of lubricant in the transmission and differential; that all grease cups are packed and that the universal joints on the propeller shaft are likewise right.

This will bring you to where you may find it advisable to call upon the repairman,—the engine. There may be a lot of knockings from many causes. The most likely of these are pre-ignition; too-far advanced; spark loose bearings, broken piston rings, worn piston cylinders or timing gears. You're pretty sure to have a lot of carbon unless you have been careful all summer. So the first thing to do is to remove this carbon and to grind your valves. While the head of your cylinders is off, examine the pistons and cylinders.

Look over your piston rings and see that they fit. After this is done, there may be a loose bearing or so. Let an expert do the work. In fact it is safer to have an expert go over your engine, but you might stand by and see that he repairs only the parts that need

Overhauling the Car

repairing. Go over the engine with him. It will be worth your time and may save money. And, while you're doing this, look after the oiling system and tighten up all water connections.

POINTS OF IMPORTANCE TO BE WATCHED WHEN OVERHAULING

Transmission and Running Gear

Take up lost motion in steering gear.
Inspect, clean and adjust clutch.
Clean transmission case and gears.
Clean universal joints.
Clean differential.
Adjust brakes and brake linings.
Clean and adjust wheel bearings.
Clean springs and inspect and adjust shackle bolts.
Clean out muffler.
Remove rust from tire rims and apply graphite or special rim paint.

Electrical System

Clean and adjust spark plugs.
Clean timer and distributor.

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Clean out housings and starting motor and lighting generator.

Examine brushes and replace where necessary.

If commutator has worn to an irregular surface, have it cleaned and trued up.

Have storage battery tested and clean and tighten terminals.

Engine

Be guided by general efficiency, as it may not be necessary to effect any extensive renewals, etc. Probably it may be sufficient to grind or re-seat valves, renew leaking gaskets and thoroughly clean out the water circulation system.

Satisfy yourself that all grease cups are filled, that there is ample lubricant in transmission and differential, and that the universal joints on the propeller shaft are well packed with hard grease. Go over these item by item with the repairman before you accept delivery of your overhauled car.

CHAPTER XX

COLD WEATHER DRIVING

COMFORT is the cry of the motorist. Especially is this true when cold weather, with all its trying attendants for motorists, holds forth.

Manufacturers have steadily increased the number and quality of comfort-making devices the past few years, until it would seem they have covered the field. But they have missed a number of details. These devices are now extras, but soon they will become regular equipment. It was only a few years ago that every motorist had to spend quite a sum for what are now supplied as essentials. The same process will soon work out on details I now have in mind.

The enclosed car rules the motor world when cold weather holds forth, though many open cars are freely used. The manufacturer has spent vast sums on refinements and lux-

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uries for closed cars. Yet a crying need has been generally overlooked. That is an effective heater. This could be easily arranged by the use either of exhaust heat or electricity. The latter is preferable. Yet it is not provided regularly. Why should a motorist get in a refrigerator-cold car to ride from one warm place to another?

When open cars are used to any extent in cold weather, tops are raised and curtains tightly fastened, making for closed car conditions as far as possible. Heat should be provided as well.

A crying need of motorists is heat for the passengers. Many devices are on the market. My preference is for the one that uses electricity.

The devices making use of exhaust heats have many enthusiastic users. Certainly a tried device of some kind should be installed, whether you have an open or a closed car.

The one absolute necessity in the cold or even mildly cold climate is a device for easier starting. A few manufacturers have worked out devices for their cars, while many acces-

Cold Weather Driving

sory makers have added them to their lines. I am of the opinion that an effective primer using high-test gasoline from a reserve supply answers this demand. Yet my eye has been effectively caught by several other devices—notably those vaporizing gas or heating intake manifolds. If you can get one of these devices under a guarantee that means something, it will be well worth while to install it. It will make life worth living in the mornings or at any time after your car has been standing idle.

These are the two prime necessities, if one wants to motor during the winter in any except the warm climates. I have spoken of the necessity for such attachments as radiator covers, anti-freeze mixtures, windshield wipers, steering wheel heaters and other similar devices.

Any manufacturer who has proven the worth of his device will guarantee its performance. Ask for such guarantee. If it is refused, don't buy. Get a good article which has shown its merit. Not only are these devices required for comfort but they pay for themselves in economy of motoring.

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In the winter too much stress cannot be laid on the absolute necessity for well-acting, properly adjusted brakes. Your own life and the lives of others are dependent upon this fact more than is realized by the great majority of motorists. I have spoken of this in an incidental way but I want to lay particular stress upon it now. With rain or snow making streets and roads slippery and unsafe it takes sane motoring to protect lives and cars. Be sensible.

If you have not tested your brakes thoroughly do so immediately, unhesitatingly. Make any needed adjustment. Inspect the linings and, if the latter are badly worn, replace with new. The cost will not be regretted if a proper working brake saves a smashup. I have seen so many cars in the cities with brakes far from properly adjusted that I am appalled by the chances motorists take.

I was once riding with a friend who insisted upon following closely behind another car. We were driving about eighteen miles an hour when the man in front stopped rather suddenly to avoid an accident. My friend tried

Cold Weather Driving

to follow suit. His brake was not properly adjusted. It did not hold. He hit the car in front. The crash was not bad, but the cost was quite a few dollars for new headlights, fender repairing, sheared grease cups and incidentals. And all without a possible excuse, for it is really criminal to have brakes which will not perform their functions in a pinch.

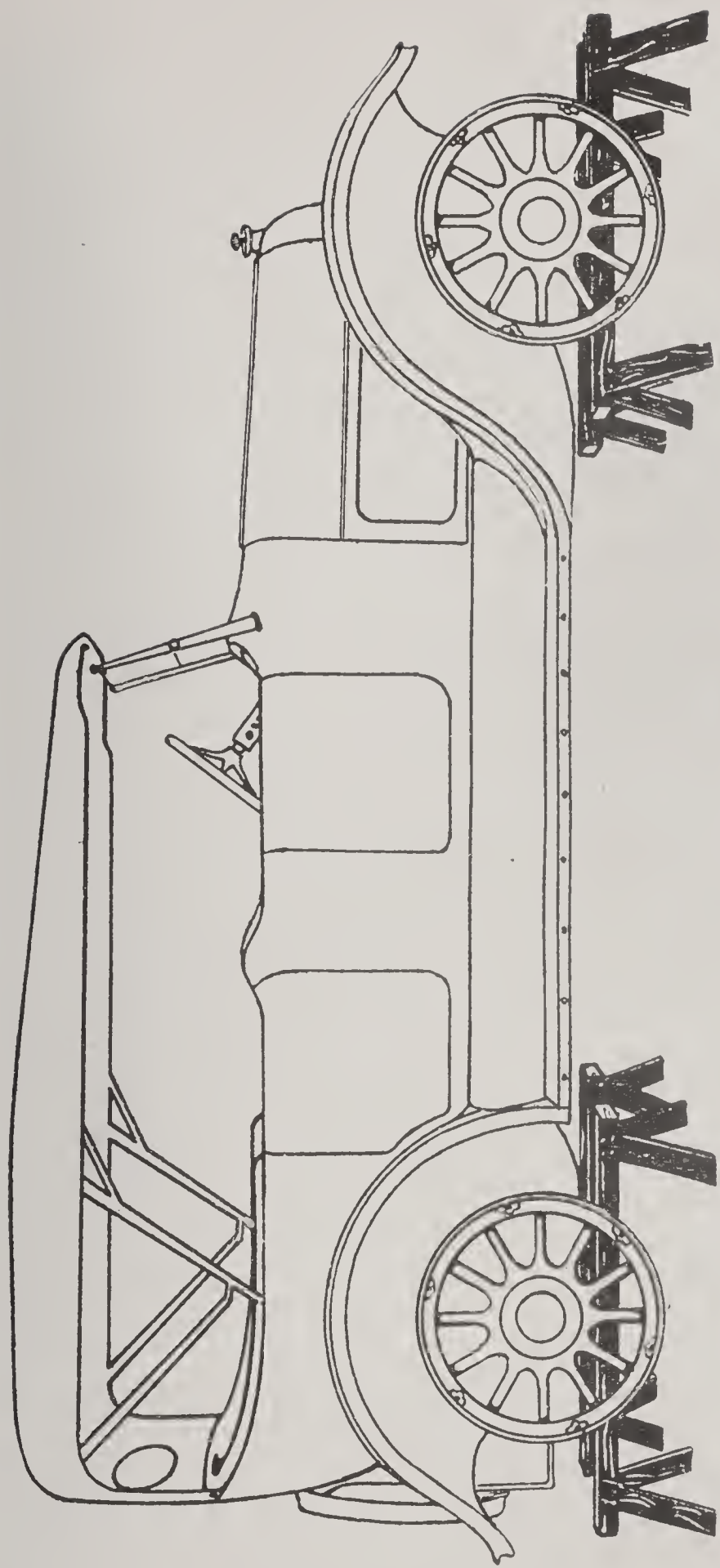
You can never tell when the pinch will come. Learn a lesson from my friend. Maybe you will not be so lucky as he was. You can gamble I read him a lecture he will long remember. Not only about having ineffective brakes but for driving so close to the car in advance. Fix your brakes so they will deliver when called upon. Also use superior judgment and avoid being forced into a pinch in so far as possible by keeping back a reasonable distance behind any car or wagon.

CHAPTER XXI

HOW TO STORE THE CAR FOR WINTER

MANY motorists, living in the colder climates and owning open cars, lay their 'busses up for the winter. Those who do this should look after a number of important things before taking this step, if they would have their cars in good condition when put in use again. Winter storage is as dangerous and costly as winter use, unless protection of the proper kind is afforded the car.

The two fundamentals which need most careful attention are the battery and the cooling system. The storage battery is a delicate affair and, unless given attention, is sure to become practically useless while in storage. Electrolyte freezes, plates break, jars collapse and, in general, the storage battery goes to wreck unless given proper care. The cooling system should be as carefully gone over before the car is laid up.



Ready for storage

How to Store the Car for Winter

The thing which should be done is to remove the battery altogether and put it in storage at a service station for the length of time the car will be out of commission. If you do not care to do this, you should see that it is fully charged, absolutely disconnected and full of water. Be sure that the latter is properly mixed by running the car a mile or so after filling and before storing. The solution should show a specific gravity of 1.28 to 1.30 to prevent freezing. It must be re-charged a bit every few weeks, either by the generator of the car or through an outside source.

The battery should be placed in a spot which is dry and free from dust. Corrosion will be caused by dampness. This is better than leaving it in the car, though it can be left in if given the once over and tested now and then. The least bit of wiring might cause the current to discharge and ruin the battery. Be sure also that you do not run the engine while the battery is disconnected or else you will burn out your generator through running on an open circuit.

In laying up the car be sure that your room

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is dry and well-protected, with an even temperature, free from humidity. Be sure that no horses are in the building as ammonia fumes are harmful to the finish of the body. You should jack the car up and place it on suitable horses which may be made from any old lumber. Have it sufficiently high to clear the flooring by several inches.

It is very important that the radiator should be drained and water jackets absolutely emptied. All should be filled with a hot soda solution and left for a few hours, after which the entire system should be flushed out with clean water. When thoroughly clean, run the engine about three minutes to dry out all the moisture. Disconnect all hose connections and stuff the openings with rags. After the cooling system is put right, go at the oiling system.

Every bit of oil in the crankcase should be drained out. The case should be thoroughly cleaned with kerosene and then a little fresh oil put in. Run the engine a few minutes in order to insure just a film of oil on the moving parts and walls of the cylinders. All the old

How to Store the Car for Winter

oil should be removed from the transmission, universal joints, rear axle, grease cups, etc., to prevent gumming and hardening during the lay-up. But be sure to remember this and re-fill in the spring. It is a good idea to tag the places from which greases and the like were removed.

Drain off the gasoline system and clean out the vacuum tank. Force a soft wire through the gasoline pipe line to remove any foreign substance. The tires should be removed from the rims, thoroughly cleaned, given a coating of mica or talcum and placed one over the other. They should be carefully covered with burlap, to protect them from light, air or water. The tubes should be inflated just enough to hold their position. Rims should be cleaned and given a coat of paint to prevent rusting.

Of course, the car should be carefully washed and polished. Get it as nearly like new, so far as finish is concerned, as is possible. Dry out every little crevice and corner and polish thoroughly. Clean the upholstery and inside, getting all the dust.

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Clean the top and, if essential, give it a coat of boiled linseed oil, if of leather. Put on the curtains and clean them too. Polish all brass and nickel parts and clean every instrument. Dust may be kept off with a thin coat of vaseline. See that all parts are free from dust or foreign accumulations and, having done so, slip a cover over the entire car and say good night to it.

CHAPTER XXII

JOIN AN AUTOMOBILE CLUB

JOIN an automobile club. Be an active member. Persuade your friends to follow suit. And work. Make your club an active, live organization, keeping it busy in furthering the interests of motorists. Help others and at the same time reap benefits yourself.

I have seen so much good work done by clubs that I am an absolute enthusiast on the subject. Every motorist in America should be a member of an active association. He owes it to himself as well as to his community, for clubs not only help individuals but do much civic work worthy of praise.

Following up the good of the local association the big national body lends a helping hand the country over. All clubs should be affiliated with a national organization. In this country the parent body which does na-

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tion-wide work is the American Automobile Association. Its activities are felt in all lines of endeavor which are for the betterment of motoring. It nationalizes the local club's efforts.

It is the local organization which lends its benefits mostly and particularly to the individual owner. It furnishes him with a meeting place for the discussion of motor subjects. It keeps him informed of all matters vital to local driving—from road conditions to epidemics of auto-stealing. It brings him in touch with his fellows of the motor circle and gives him opportunities to consult them on all kinds of car subjects.

But the greatest good done by the local motor club is of civic character. Laws are reformed at the suggestion of studious motorists. Roads are built upon the preachment of club members. Thieves are caught by the activities of the association. Tips are given on every side, the result of experiences of fellow clubmen. Signboards are placed, tours outlined and hundreds of well-paying undertakings performed through club efforts.

Join an Automobile Club

I know many miles of fine roadway built exclusively through the instigation and untiring work of motor clubs. I know of many thousands of signboards, warning notices and helpful bulletins erected and distributed by clubmen. I know of speed-traps made useless and of many frights to motorists removed through organizations. I know of so many good things done by clubs, which individuals could not have accomplished, that I want to lend any influence my words may have to the upbuilding of motor associations.

Be a good citizen and good motorist by joining your local club. It will pay you. If there isn't a club convenient, organize one.

Probably more good work has been done by the Automobile Club of Southern California than any other single association in the United States. This is said with a full realization of the wonderful activities by other clubs. But the Californians have been particularly active for years and the club is generally referred to as an ideal organization.

Realizing the great drawing power of good roads in a community and their powerfully

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paying investment, this club has not only gone out and worked for the building and maintenance of roads, but has done much to keep them ideal for motorists. Signboards, warning boards, road condition reports and all the thousand and one detail performances possible to excellent motoring conditions have been accomplished. And yet the club is more active to-day than at any time in the past. It is a wonderful club to pattern after.

Thousands are drawn from all parts of the country to California because of the civic virtues shown by this club. It pays all classes of citizens and is consequently fostered by many who are not motorists.

CHAPTER XXIII

THE ANTI-GLARE PROBLEM

THE so-called anti-glare problem is a development of the last few years. In the days of oil lamps the chief difficulty was to obtain enough light to drive by and there was not the slightest danger of anyone's being dazzled by the illumination from another car. With the acetylene lighting system illumination was much improved, but only towards the dawn of the electric-lighting age was there an acetylene light of such brilliancy as to produce danger of dazzling other users of the road. When electric lights came into general popularity, all this changed. By using high-powered bulbs and scientifically designed reflectors, it became possible to throw a beam of intense brilliancy, which would temporarily "blind" anyone approaching it.

This finally produced a crisis in the matter, so that various law-making bodies took up the

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matter and state and municipal laws were passed, forbidding the use of headlights that were capable of dazzling users of the highway. The car owner has somewhat of a divided interest in this question, for in the first place he wants enough light to drive by in safety and yet he does not want to be blinded by the headlights of every car that he passes on the road.

We will first take up the problem of securing satisfactory light from the user's standpoint. To begin with it must be understood that many lamps will only give adequate light when they are fitted with a certain type and size of bulb. The motorist should find out what bulb gives the best service with his lamps and should always have a supply on hand, even to carrying spares in the car. Special cases may now be had to prevent breakage of bulbs carried in the car.

Not infrequently it happens that the bulb is imperfect after it is bought. Sometimes there is too much solder on the base, so that it does not make a perfect contact. In this case the owner can file off the solder, which will remedy the trouble.

The Anti-Glare Problem

Another cause of faulty lighting is improper adjustment of the bulb. The bulbs have got to be focussed, if you are going to get really good lighting. Drive your car up facing a wall or the side of a barn or similar location; about twenty feet away will be the right distance. Fix the bulbs so that they are as far back from the reflectors as possible. The light circle thrown by the lamps should have a black spot in the centre. In case the black spots do not appear, it means that the adjustment is limited in its movement to the rear. If the black spot is away from the centre, it means the filament is not in the axis of the reflector. This trouble is sometimes caused by the bulb not seating quite right and a half turn given to the bulb before putting it back in the socket may remedy the difficulty. If the bulb shows a tendency to spring out of correct alignment, it means that something is wrong with the socket.

After the black spot has been brought into the exact centre of the circle of light thrown by the lamp, it must be adjusted to get rid of this dark area. By means of the adjustment move

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the bulb forward until the black spot disappears.

There are a lot of different kinds of devices used for making adjustments in lamps. In some of them the bulb itself is moved and in others a screw at the back makes the adjustment, while in still others the rim of the lamp is moved. In the type where the bulb itself is moved, you must be careful not to loosen the bulb from its base when making adjustments.

Another source of faulty lighting is found in lost motion existing between the socket and the bulb. When this occurs the centre line of the filament does not coincide with the centre line of the reflector, which distorts the image cast by the lamp. Some bulbs are made so that the centre of the filament is off the centre line of the base; poor light is the result, but sometimes by shifting the bulb around this can be remedied.

Just as every other part of the motor car demands attention, the lamps ought to be given periodic inspections. See that the filaments are properly lined up with the bases. When any bulb seems questionable in this respect,

The Anti-Glare Problem

the thing to do is to replace it with a new one.

Now coming down to controlling the light supply so that it may serve the user without injuring others, we find that most anti-glare laws provide that no beam of direct light shall be thrown higher than forty-two inches above the ground. As a matter of fact this does the motorist no injury, as he needs the light on the road and not in the air. Some lamps have an adjustment so that their beams may be directed down to comply with such laws, or it is very easy to have the brackets bent over, which serves the same purpose.

Supplementing this, there are many so-called glare-removers on the market, designed to control the light so that the driver gets all that he needs on the road, without any of the dazzling beams being thrown into the eyes of approaching users of the road.

There are certain definite methods of handling the problem of glare removal. One type removes the glare at the bulb, which may be done by actual dimming or by using non-glaring colors, by partly covering the bulb and by frosting. Another type of device eliminates the glare at the reflector and in this case

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the color of the light may be altered, the upper portion of the reflector may be offset from the lower to throw the light down on the road or the upper range of the reflector may have an inclined axis for deflecting the brilliant rays. The third class eliminates the glare at the lens or glass front. In this case the glass front may be so constructed that it deflects or diffuses the dazzling beams or it may be frosted or colored, usually amber, or it may be covered by a shield to eliminate the bright beams in the forbidden area. Some of these lenses are designed to redirect or bend down the glaring light.

Some states stipulate that certain forms of glare-removing devices shall be used, while in others the bending over of the headlight brackets so that the light is directed downward is all that is necessary. At the last count there were twenty or more states with anti-glare laws and before long practically every one of them will have some law of this sort. So it is important for the motorist who intends to tour, to get a set of glare-removers that are generally approved, so that he will be within the law in every state.

CHAPTER XXIV

DRIVING SUGGESTIONS AND DON'TS

Always keep your car under perfect control.

Become thoroughly familiar with your local traffic regulations and follow them to the letter.

Practice shifting gears until you know instinctively from the car's speed just when you should make each shift.

Put the gears in second speed when driving in heavy traffic where sudden starting and stopping is necessary.

Speed up on approaching a hill.

Drive using the lower gears. Shifting of gears really shows a good driver and at the same time often prevents stalling the engine in a dangerous place.

Never speed your engine up during the first 200 miles of its life.

Consider the man in the other car.

Drive slowly at turns in the road, in order

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to have sufficient time to avoid a vehicle that may be coming toward you.

Drive slowly at cross roads for another car may be coming, attempting to cross at the same time.

On bridges, embankments and narrow roads take a slow pace, keeping the car under instant control.

On approaching the brow of a hill be sure that you are on the right side of the road. Someone may be approaching from the opposite direction.

Slow down when a horse ahead shows signs of fright, and, if necessary, stop the engine.

Do not follow a car too closely, for it may stop without warning.

Do not race with anyone on the road, as this has caused the majority of automobile accidents.

Stop when there is an accident, whether it is your fault or not, and render all the assistance possible.

Sound the horn when approaching a turn in the road or the brow of a hill, for another car may be coming toward you.

Driving Suggestions and Don'ts

In passing a car from the rear, always sound your horn as the driver of the car may unintentionally cut-in ahead of you.

Accustom yourself to the use of the brakes.

Learn to judge distances and speed at which a car travels. Ability to estimate speed may prevent accidents.

Don't forget, above all else, that an automobile is a fine piece of machinery and that you will be repaid in excellence of service many times for the care and attention given it.

Don't start on a trip without attention to lubricating oil, gasoline and water.

Don't fail to keep your brakes adjusted. It is more necessary to be able to stop a car than to start it.

Don't leave the car alone with the engine running.

Don't fail to release the hand brake before attempting to start.

Don't attempt to start the engine unless the spark is retarded and the switch key inserted and turned in the switch.

Don't spend a lot of time cranking the engine with the starter if it fails to start after

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a few trials. Look for the cause of the trouble. Continuous cranking runs down the battery.

Don't jam the gear shifting lever from low to reverse, or vice versa, until the car has come to a dead stop, and then take your time.

Don't drive fast or apply the brakes suddenly on wet pavements.

Don't fail to use plenty of lubricating oil and grease where needed before starting on any trip and do not use a cheap grade of oil or grease at any time.

Don't neglect necessary adjustments and repairs until it is too late and you are laid up by the roadside.

Don't attempt to run the car on the electric starter.

Don't race the engine. You cannot abuse the engine worse than by allowing it to race at high speed without a load.

Don't start your car with a jerk. Always engage the clutch gradually, and see that the car starts off easily.

Don't advance the spark lever when cranking.

Driving Suggestions and Don'ts

Don't attempt to shift the gears without first releasing the clutch.

Don't rush a repair job. Remember, "what is worth doing at all is worth doing well."

Don't drive fast around corners; it is dangerous and destructive, especially to tires.

Don't fail to examine electrical connections, gasoline and oil lines and bolts and nuts occasionally, and see that everything is intact.

Don't neglect your lamp connections. It is very easy when washing a car to disconnect one of the wires.

Don't leave switch key turned in switch when the engine is not running. This will run down one-half of the storage battery and will be liable to injure the ignition unit.

CHAPTER XXV

SEMI-MONTHLY INSPECTION OF CAR

(As given by a manufacturer and endorsed by me.— B. O.)

Too much emphasis cannot be laid on the importance of inspecting your car regularly. Every piece of machinery in a well ordered establishment receives systematic and frequent inspection and lubrication. It is as necessary for you to inspect and lubricate your car if you care to have it give satisfaction and service as it is for the manufacturer to have regular and frequent attention given to his shop equipment. An automobile, while costing much less than some shop equipment, is subjected to the hardest kind of use in driving over rough streets, around sharp turns and with perhaps several bursts of speed in every hundred miles of travel. Therefore it is necessary that you pay strictest attention to its lubrication and inspection.

Semi-Monthly Inspection of Car

Follow your lubrication chart, and the lubrication diagram very closely and do not, under any circumstances, neglect giving your car a regular, thorough and systematic semi-monthly inspection.

It is important that the compression in all the cylinders should be equal and up to the proper standard. Faulty compression may be shown by loss of power or missing of the engine. Compression should be tested occasionally by cranking the engine with switch key out until resistance is felt in each of the four cylinders successively. If the compression in one cylinder is less than others or if all are weak, the valves may not be seating properly. It may be on account of too little clearance between the valve stems and the valve lifters, or because there is a small deposit of carbon on the seat of the valve. Either of these faults should be taken care of at once. If a valve seat is allowed to remain coated with carbon for any great length of time it becomes badly pitted and much harder in the end to grind to a smooth seat.

Inspect the wiring, terminals and spark

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plugs. See that all connections are tight and the insulation is in good condition. Examine the storage battery by removing the small vent caps and taking hydrometer readings. See that all cells are filled to the proper level with pure distilled water.

Inspect the radiator to cylinder water connections for possible leaks in the hose. The importance of having water tight connections is emphasized by the fact that there is likely to be no circulation of the water in the cooling system unless the radiator is kept full. Be sure there is no obstruction to the flow of water through the radiator tubes. With restricted circulation, as with no circulation, there is grave danger of your engine overheating.

Inspect the carburetor and gasoline line for any possible leaks. A small leak will cause an unnecessary waste of gasoline. See that the gasoline line packing nuts are tightened properly and that the flow of gasoline to the carburetor is unrestricted.

Inspect the fan belt for proper tension to turn the generator. Do not wait for the fan

Semi-Monthly Inspection of Car

belt to break before replacing with a new one as an excessively worn or stretched belt will not drive the generator at a sufficient speed to generate the necessary current to keep the storage battery in condition.

Examine foot and hand brakes. See that all connections, such as clevis pins and lock nuts for turnbuckles, are secure, that parts are not rust bound and that the brakes are in proper working order.

Inspect all steering connections for loose nuts and bolts. Keep the steering gear and steering connections in proper working order. A small amount of attention to these parts will add much to the ease of operation and the pleasure of driving your car.

Inspect the spring bolts and hangers. Keep the spring clips tight. Be sure that the rear spring seats are free to move on the axle housing, and that front and rear springs are held tightly to their respective seats. Bear in mind that springs are less apt to break if the spring clip nuts are kept tight.

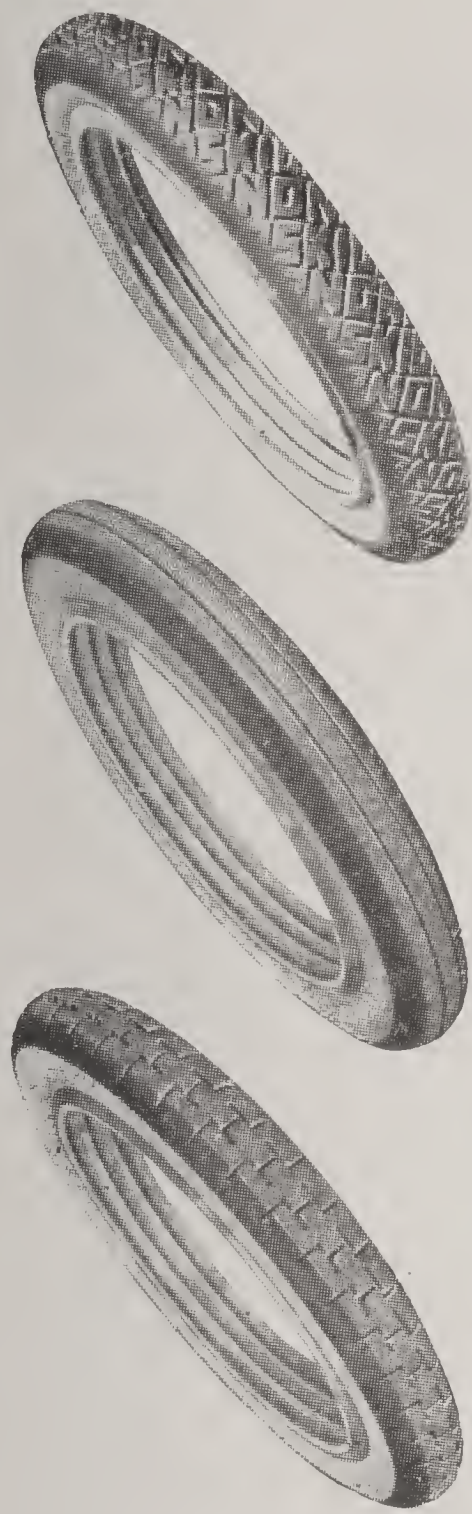
Tighten all wheel, body, and fender iron

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bolts. Inspect all bracket bolts and be sure they are tight. This will eliminate annoying rattles, and will add to the life of your car.

Examine the tires for any possible cuts or bruises. If not taken care of at the start, water and sand will work under the outside tread and cause blisters, which in time will loosen the entire tread. Remember that more than three-fourths of all tire trouble is due to under-inflation.

Every two thousand miles, take off the front wheel hub caps, clean and examine the bearings, repacking same with lubricant. Heavy cup grease is most desirable. With the wheel jacked up, rock the wheel to see that it moves freely and shake the wheel sidewise to see if there is any play or lost motion in the bearing. Should there be any play, remove the wheel and inspect the bearings carefully. In the event that any of the balls have broken or become badly worn, it is better to replace them with a complete set of new balls rather than attempt to replace the worn balls only. If cones have become badly worn or scored, replace with new.



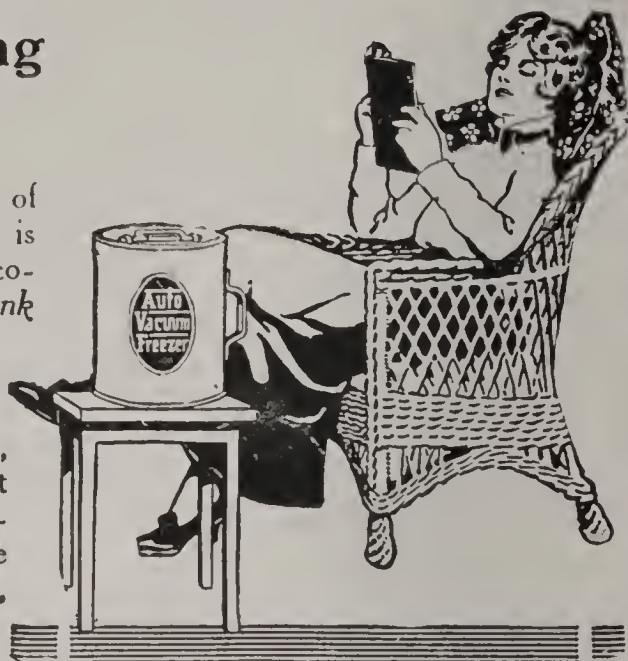
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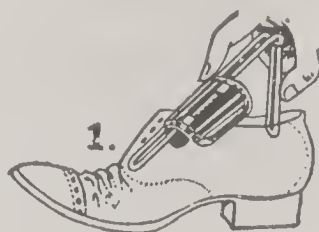
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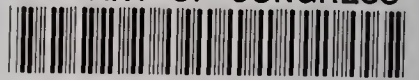
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